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ABSTRACT

The National Park Service originated with the passage of the Organic Act of 1916. Since then the National Park Service and the U.S. government have designated many places to be protected, either because of their historical significance or natural significance to the nation. In Kentucky, Mammoth Cave National Park is one of four national parks. Each National Park Service area has its own unique cultural, biological, and geological significance. Cultural heritage (people), vegetation (plants), wildlife (animals), and landforms (rocks) are the reasons the parks were set aside. This multidisciplinary activity guide for Mammoth Cave National Park is for students in grades 4 and 5. The guide provides detailed instructions for implementation of the diverse activities. It is divided into three charts: (1) "Subject Chart"; (2) "Setting Chart"; and (3) "KERA Goals Chart"; and 10 activities: (1) "Plotting Protected Places"; (2) "Exploring Emblems"; (3) "Acorn Mix-Up"; (4) "Case of the Mysterious Rocks"; (5) "Current Song"; (6) "Clear as Mud"; (7) "Kentucky Capsules"; (8) "In Remembrance"; (9) "Findings from the Field"; and (10) "Cover All!" (BT)

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ED 468 212

MAKING CONNECTIONS

A curriculum and activity guide to Mammoth Cave National Park

Gr 4-5

SO 034 070

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Subject Chart

Subject ⇩ *Lesson No.* ⇨	1	2	3	4	5	6	7	8	9	10
Art		■		■	■				■	
Career Education	■					■			■	
Geography	■									
Government	■								■	
Health						■				
Language Arts		■	■	■	■		■	■	■	■
Mathematics	■		■			■				■
Music					■					
Physical Education			■							
Science			■	■		■	■		■	■
Social Studies	■	■			■	■	■	■	■	■

Setting Chart

Setting ⇩ *Lesson No.* ⇨	1	2	3	4	5	6	7	8	9	10
Indoors	■	■	■	■	■	■	■	■	■	■
Outdoors	■	■	■	■	■			■	■	

KERA Goals Chart

Academic Expectations ⇩ *Lesson No.* ⇨	1	2	3	4	5	6	7	8	9	10
1	■	■	■	■	■	■	■	■	■	■
1.1	■					■		■	■	
1.2	■					■	■	■	■	
1.3						■		■		
1.4		■	■	■	■		■			■
1.5-1.9	■					■				
1.10	■	■	■	■		■	■		■	■
1.11		■		■				■	■	
1.12							■		■	
1.13		■		■	■			■	■	
1.14					■					
1.15			■							
1.16								■		
2	■	■	■	■	■	■	■	■	■	■
2.1			■	■		■			■	■
2.2			■			■	■			■
2.3			■			■				
2.4			■			■				
2.5			■	■		■			■	
2.6			■			■				
2.7	■					■				
2.8						■				
2.9	■									
2.10	■					■				
2.11										
2.12										
2.13			■			■				
2.14	■								■	■
2.15										
2.16		■			■		■	■		
2.17								■		
2.18										
2.19	■				■			■		
2.20		■					■	■		
2.21		■			■		■	■		
2.22	■			■	■			■	■	
2.23	■			■	■			■	■	
2.24										
2.25					■			■		
2.26										
2.27										
2.28										
2.29										
2.30										
2.31										
2.32										
2.33						■				
2.34										
2.35										

PLOTTING PROTECTED PLACES

SUBJECTS: Math, Geography, Career Education, Government and Social Studies

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5 and 6

ACADEMIC EXPECTATIONS: Use reference tools and research tools; make sense of a variety of materials they read; use mathematical ideas and procedures; organize information and use of classification rules and systems; understand and use number concepts; understand use of space and dimensionality concepts; understand and use measurement concepts; understand the democratic principles; recognize, apply and understand the relationship between people and geography; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; organize information to develop or change their understanding of a concept; use a decision-making process to make informed decisions; connect knowledge and experiences from different subject areas; use what they already know to acquire new knowledge, skills, or interpret experiences; and expand their understanding of existing knowledge.

DURATION: One class period of 45-60 minutes

GROUP SIZE: One classroom of 25-35 students (or less)

SETTING: Indoors or outside at tables

KEY VOCABULARY: Coordinates, plot, map, key, National Park Service

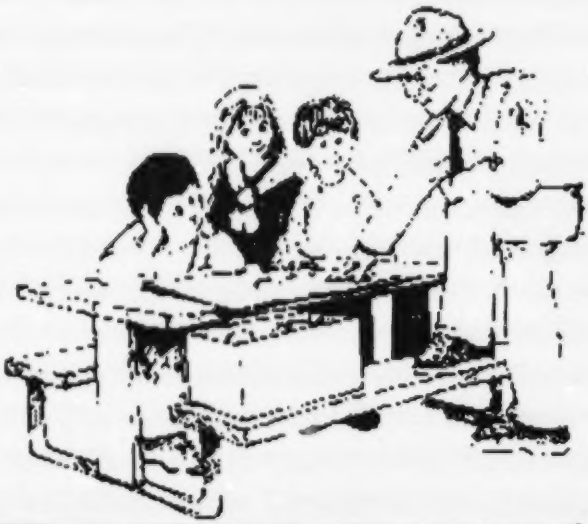
ANTICIPATORY SET: Can anyone think of a definition for the word plot? A word that means the same thing will be fine too. Today we are going to find and plot some special places on a United States map!

OBJECTIVES: The students will be able to: 1) read a map to find various locations; 2) plot several locations on a map; 3) work independently using map reading skills.

MATERIALS:
- Plotting Protected Places activity sheets
- Pencil
- Ruler

BACKGROUND: The National Park Service (NPS) originated with the passage of the Organic Act of 1916. Since that time the National Park Service and the United States government have designated many places as valuable places to be protected. These places are selected because of their historical or natural significance to our nation. Today there are over 380 National Park Service areas across the country. These areas include national parks, national monuments, national battlefields, national seashores, national recreation areas and national wild and scenic rivers. In Kentucky, there are four National Park Service areas including: Mammoth Cave National Park, Abraham Lincoln Birthplace National Historic Site, Big South Fork National River and Recreation Area, and Cumberland Gap National Historical Park. Each National Park Service area has its own unique cultural, biological, and geological significance. Cultural heritage (people), vegetation (plants), wildlife (animals), and landforms (rocks) are the reasons the parks were set aside.

Mapping is a basic skill that requires taking information given in one area and correlating it to another. The correlation gives meaning to new information. As far back as human history can be traced people have been making and reading maps. This unique way of communication can only be achieved through a medium such as a map.



PLOTTING PROTECTED PLACES

PROCEDURE:

1. The teacher presents the students with a map. The teacher asks the students if they can find a key on the map. The students should read the map and find the directional diamond for North, South, East, and West.

2. The teacher asks the students what National Park Service Area is at _32,M_? The students should respond _Mammoth Cave National Park_.

3. The teacher asks the students, "Where is Yellowstone National Park?" A student responds _13, T_.

4. The teacher asks the students to work on the first part of their activity page, numbers 1-4.

5. Together the class reviews the answers to the first half of the activity sheet.

6. The teacher and students review the second half of the activity sheet. The teacher points out that there is a map that will help the student to plot the parks listed in the second half of the activity.

7. The students work individually on the second half of their sheet.

8. The class reviews this part of the activity sheet.

9. The teacher then asks the students one final question- If you could create a park anywhere in the United States, at what coordinates would you put it? What plants, animals, people, and rocks would your park protect? In a few sentences describe your park at the bottom of your activity sheet.

10. The students share their created parks, if they choose to do so.

CLOSURE: Today we have plotted a few of the many National Park Service areas that are located all over the country. Each one is a special place and has a very special story to tell.

EVALUATION: The teacher is able to evaluate the students through their class participation and through the answers they have turned in on their activity sheets.

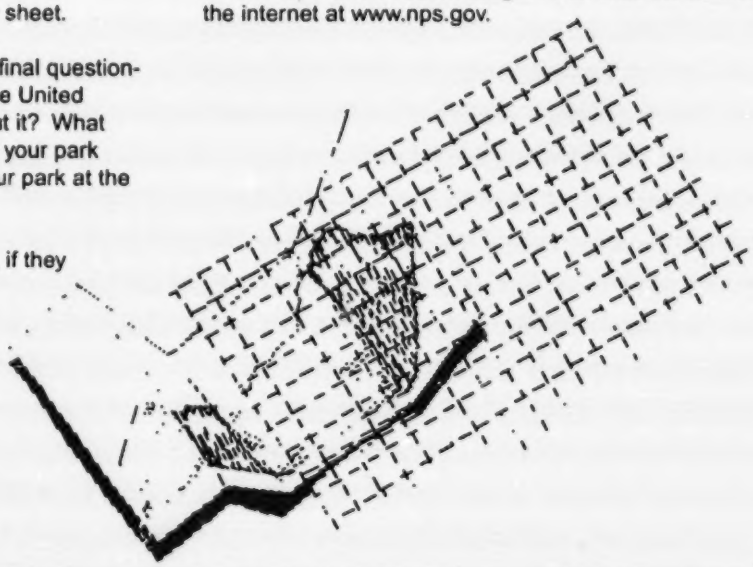
EXTENSIONS:

1. The teacher could have the students look at a United States road map and map out a vacation to several different parks. The students could then list the coordinates from that map for each National Park.

2. The students could create a graph of their classroom, plotting various items in the room.

3. The students could take a look at a Kentucky map and find the four national park areas that are within its borders. Then they could look at the coordinates of the National Parks found on that map. They could also find their town on the map. The students could then measure the distance from each park to their home-town.

4. The students could select a favorite National Park Service site and could investigate that area via mail or the internet at www.nps.gov.



PLOTTING PROTECTED PLACES ACTIVITY SHEET

Name:_____ Date:_____

Map Index:

Index #	National Park Service Site	Coordinates
1.....	Acadia National Park.....	43,W
2.....	Big Bend National Park.....	17,D
3.....	Dinosaur National Monument.....	13,O
4.....	Everglades National Park.....	38,B
5.....	Gettysburg National Military Park.....	38,Q
6.....	Glacier Bay National Park.....	+,+
7.....	Grand Canyon National Park..... ..	9,K
8.....	Hot Springs National Park.....	26,I
9.....	Mammoth Cave National Park.....	32,M
10.....	Martin Luther King, Jr. National Historic Site..	34,J
11.....	Mount Rushmore National Memorial.....	18,T
12.....	Redwood National Park.....	2,S
13.....	Wright Brothers National Memorial.....	40,M
14.....	Yellowstone National Park..... ...	13,T
15.....	Yosemite National Park.....	5,O

1. Mammoth Cave National Park is the site of the longest known cave system in the world. Its coordinates are 32,M. Find a star on the map at these coordinates and put Mammoth Cave National Park's index number by it. Index number _____.

2. National Parks were developed to take care of all the resources inside their boundary lines. These resources include Vegetation (plants), Wildlife (animals), Cultural History (people), and Landforms (rocks). Can you list a park from the index that is best known for each topic?

Vegetation: _____

Wildlife: _____

Cultural History: _____

Landforms: _____

*Each park protects everything in its boundary, but some answers are better than others.

PLOTTING PROTECTED PLACES ACTIVITY SHEET

3. On the map, which park is furthest East? _____

   What are its Coordinates? _____

4. Name the two parks in California and their coordinates. _____

   _____

5. Now add these parks to your map.

Everglades National Park
Grand Canyon National Park
Yosemite National Park
Big Bend National Park
Mount Rushmore National Memorial

6. On the map which park is furthest south? _____

   What are its coordinates? _____

7. Which Park is known for its famous inventors? _____

   What are its coordinates? _____

   *BONUS What was the famous invention?_____

8. California is the state with the most National Park Service Sites.

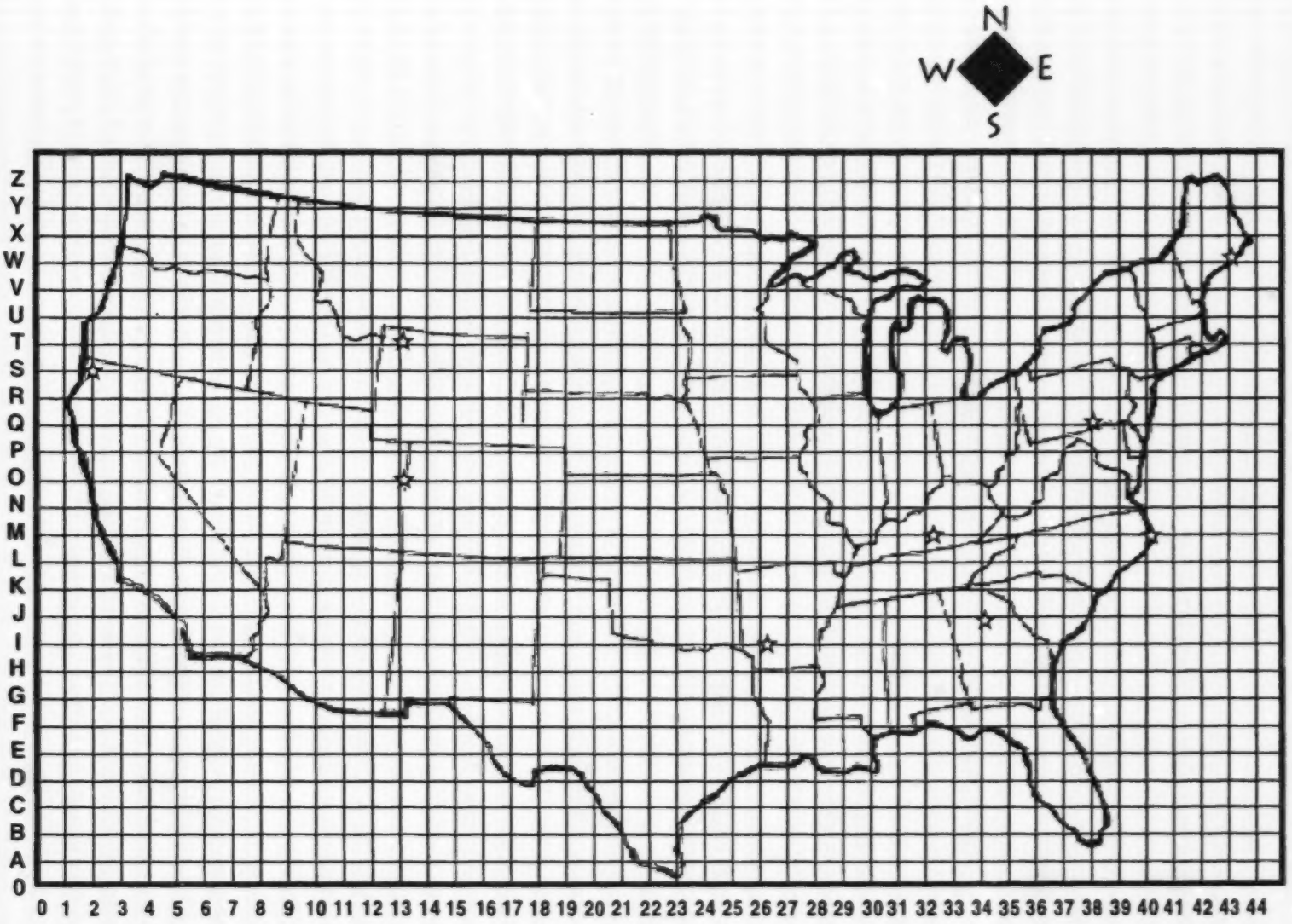
Put Parallel lines (///) through the state to mark that it has the most sites.

9. Delaware is the only state without any National Park Service Sites. Shade Delaware with your pencil.

10. Look at your index. There are no coordinates listed for Glacier Bay National Park.

Why or why not?_____.

Your map shows only a few National Park Service Sites. There are currently over 380 National Park Service Areas.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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44

EXPLORING EMBLEMS

SUBJECTS: Language Arts, Art, and Social Studies

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5 and 6

ACADEMIC EXPECTATIONS: Make sense of various messages to which they listen; organize information and use of classification rules and systems; write using appropriate forms, for different audiences and purposes; make sense of and communicate ideas with visual arts; observe, analyze, and interpret human behaviors, social groupings and institutions; understand, analyze, and interpret historical events; create works of art and make presentations; analyze their own and others' artistic products; show skills to become self-sufficient individuals; show abilities to become responsible members of a family, work group, or community; use creative thinking skills to develop ideas or products; connect knowledge and experiences from different subject areas; and use what they already know to acquire new knowledge, skills, or interpret experiences.

DURATION: One class period of 40 to 50 minutes

GROUP SIZE: One or two classes of 10-60 students

SETTING: Indoors or outside with clipboards

KEY VOCABULARY: emblem, symbol, represent, National Park Service

ANTICIPATORY SET: An emblem is something unique that identifies an organization or group of people. We have looked at the United States map and some of the National Parks found in different areas of our country (refer to Plotting Protected Places). Does anyone know the emblem that represents the National Park Service?

OBJECTIVES: The students will be able to: 1) identify what specific symbols were selected for the National Park Service arrowhead; 2) select symbols to create an emblem that best represents them.

MATERIALS:

- Overhead projector
- Emblem sheets transferred to overhead transparencies
- Small paper plates or another comparable shape
- Crayons
- Markers
- Pencils

BACKGROUND: The National Park Service emblem is found on the left sleeve of every park ranger and on many signs and buildings found in national parks. The arrowhead was authorized as the official National Park Service emblem by the Secretary of the Interior on July 20, 1951. The elements found on the patch symbolize the major facets of the National Park system, or as former director Connie Worth put it, "what the parks were all about." The sequoia tree and the bison represent vegetation and wildlife, the mountains and water represent scenic and recreational values, and the arrowhead represents historical and archeological values.

Emblems or symbols are selected because they represent something that is characteristic of a group. You may wish to research your school emblem and the reason it was selected. Many symbols include wildlife, because of the "message" animals depict. A "fierce" lion, a "wise" owl, or a "proud" eagle are ways we view some animals.

EXPLORING EMBLEMS

PROCEDURE:

1. The class works with the teacher to identify the arrowhead as a symbol of the National Park Service. The teacher places the transparency of this symbol on the screen.

2. The class looks at the picture and names the symbols found on the arrowhead. The teacher reminds the students that these are symbols that have been selected to represent certain things in all National Park Service areas. The teacher asks the students what each symbol represents. The sequoia tree represents vegetation. Remember not all parks have trees, some have cactus, or prairie grasses. The bison represents wildlife, including bison, deer, rabbits, prairie dogs, gila monsters, turtles, big horn sheep, bears, and many more. The mountains and water represent scenic values (landforms, vistas, canyons, etc.) and recreational values for visitor enjoyment. The arrowhead represents historical and archeological values (people and our growth as a nation).

3. The class discusses why the bison was selected instead of a white-tail deer. Or why the sequoia was selected instead of an oak. The teacher can remind the students of **National** in National Park Service. Symbols that were impressive or significant to the nation were selected. Bison once roamed most of North America. It was a large animal that symbolized the wildness of the American west, thus it was selected to represent wilderness associated with National Parks. The sequoia was believed to be the oldest living thing until the mid-1950's. One tree, named the "General Sherman Tree" is over 270 feet high, 115 feet around, and over 3,000 years old. Because of their size and age these trees symbolize something that is unique and worth protecting.

4. The teacher passes out paper plates to each student and has them draw a symbol that represents them and the things that are important in their lives. The teacher asks the students **not** to put their name on the front of their emblem.

5. The students trade their emblems with classmates. One student presents another child's work. The others are asked if they can identify the emblem's owner.

6. The teacher asks students to think of the symbol or mascot that has been selected for their school. Why was it selected and how does it represent their school?

CLOSURE: Emblems are important to us because they represent things that we support or believe in. They are symbols that were specifically selected to represent us.

EVALUATION: The teacher is able to evaluate the students by reviewing their emblems and through class discussion.

EXTENSIONS:

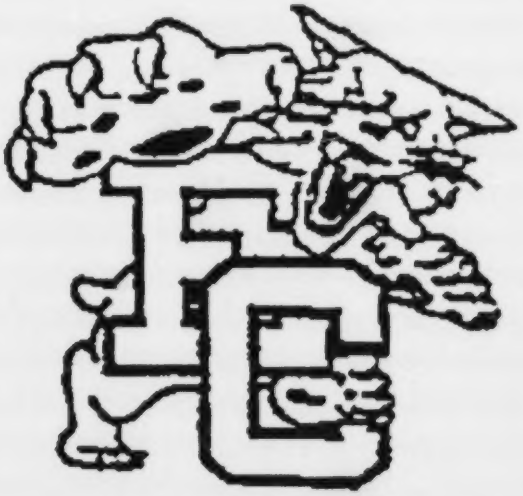
1. The students could bring in Kentucky college emblems and mascots. This could lead to discussions of why various symbols were selected to represent that school.

2. The students could evaluate several state flags and discuss why the symbols were selected and what that means to the state. How many historical symbols or figures appear in these flags?

3. The students could evaluate the flags of other countries. They could then make a chart that included plants, animals, and objects. The students could graph how many times these appear in flags from around the world. This could also be done with colors.

*This lesson was adapted from a Project Wild activity.

EXPLORING EMBLEMS



GATORS

EXPLORING EMBLEMS

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ACORN MIX-UP

SUBJECTS: Science, Language Arts, Mathematics and Physical Education.

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: Make sense of various messages to which they listen; organize information and use of classification rules and systems; make sense and communicate ideas with movement; understand scientific ways of thinking and working; identify, analyze and use patterns; identify and analyze systems; use the concept of scale and scientific models; understand conditions of nature; understand change over time; understand and use statistics and probability; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; use critical thinking skills to solve a variety of problems in real-life situations; use a decision-making process to make informed decisions; use what they already know to acquire new knowledge, skills, or interpret experiences; connect knowledge and experiences from different subject areas; and expand their understanding of existing knowledge.

DURATION: One class period of 20-30 minutes

GROUP SIZE: One to two classrooms (15-60 students) or more

SETTING: Indoors or outside

KEY VOCABULARY: seeds, acorns, soil, germinate, drought, hazard

ANTICIPATORY SET: Today we are going to see how trees in a forest are able to survive. The tree we are going to talk about begins its life as an acorn. Does anyone know what kind of tree this would be?

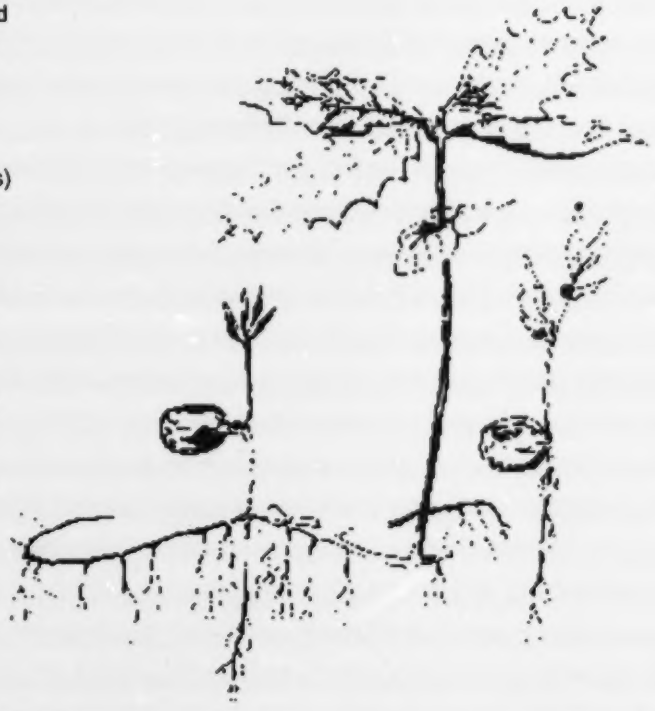
OBJECTIVE: The student will be able to: 1) discuss different factors that help or hinder the growth of tree seedlings; 2) work productively in small groups.

MATERIALS:

- Four or five bases
- Acorn Mix-Up cards (card titles on the following pages) Paste each title on a colored 5" x 8" index card and laminate

For 30 students:

- Six "Sunlight" cards
- Six "Warm Spring Day" cards
- Six "Water" cards
- Six "Good Soil" cards
- Six "Acorn" cards
- One "Drought" card
- One "Eaten by Deer" card
- One "Flood" card
- One "Poor Soil" card
- One "Fire" card



ACORN MIX-UP

BACKGROUND: "A tree is only a small part of a complex community of life forms that inhabit a forest. Within the forest ecosystem, animals, microscopic organisms, smaller plants, as well as other trees and shrubs struggle together and against one another for five basic necessities: food, water, air, light, and shelter." The above information was taken from *Kentucky Forest Trees: How to Know Them*, produced by University of Kentucky, College of Agriculture.

During their lifetime, trees may produce a million seeds and yet only a small percentage will ever become a tree. Acorns need sunlight, good soil, water, and warm spring days in order to germinate. They also need at least a brief period of freezing for germination to be successful. Even after successful germination, a small tree could die due to hazardous weather conditions such as drought, flood, or fire. Other hazards affecting acorn success could include poor soil or being eaten by a deer. Once a tree is established it will take in water and nutrients from the earth. Trees give the earth the stability it needs to hold soil together to prevent erosion. As long as a tree continues to get water and nutrients from the soil it will flourish for many years to come. When a tree dies it permits sunlight to warm the earth allowing new seedlings to germinate and take its place.

Oaks are used for many things. Their most common uses are in furniture, timber for building, flooring, landscaping around buildings, and barrel making. The oak tree was and continues to be the most commonly used tree to mark boundaries when surveying.

In an oak/hickory forest, fire can be a hazard. In other types of forest, some trees, such as the ponderosa pine, need fire to complete the germination of their seeds. This could lead to a discussion about how different plants in different habitats have distinct needs and what could be hazardous to one species of tree may not affect another.

PROCEDURE:

1. In a classroom or outdoors, the teacher asks the students what is needed to make acorns grow into mighty oaks. The students should come up with answers like water, sunlight, warm spring days and soil. As the students come up with the answers the teacher should show the students the cards with the words on them. **Do not show the hazard cards!**

2. Use the concept of a baseball diamond and designate four or five bases. The teacher has the students randomly choose a base to stand near. (There needs to be at least five students near each base. If the group is small make fewer bases.)

3. Place all of the cards (adjust the sets of cards according to the number of students) in the center. Instruct the students to pick up one card and without looking at it go back to their base.

4. Have each student secretly look at his/her card. The teacher asks the students with the acorn cards to raise their hands. Groups without a seed can't win - they represent areas where seeds did not land. Ask these groups to sit down.

5. Ask each group with a seed to reveal a sunlight, water, warm spring day and good soil card. If all of these cards are present the seed can germinate. Then ask if there is a hazard card labeled either: eaten by deer, flood, drought, or poor soil. If so, the tree dies!

6. If no tree survived, have the students at each base decide what cards they would like to trade in for new ones. They will want to get rid of hazard cards and even good cards for which they may have duplicates. Each group should send one representative for each card they want to trade into the center to pick a new card- without looking at the new card. The students can continue trading until each group has a mixture of cards which will allow their tree to survive. If necessary, remove some hazard cards to insure survival.

7. Ask the students if it was easy for their seed to survive. You may want to play a few more rounds. (**Note:** you may want to begin by playing a round or two without any hazard cards and then add them for

the last round or two to see how they change the game.)

8. The teacher discusses with the students how difficult it is for seeds to survive and grow. This is why trees have so many seeds, but very few seeds are able to become a tree.

9. The teacher may like to ask students further questions, such as: Some seeds are large like acorns. Is this an advantage? Some seeds are covered with a berry. Why is it an advantage for an animal to eat it? Do animals have similar needs in order to raise their young?

CLOSURE: We have seen what is required for acorns to germinate and begin to grow into trees. If any of the important elements such as sunshine, warm spring days, water, or good soil are missing then the acorns are unable to grow. It is the same with us. If we do not get the food, water, air, and shelter we need we are also unable to grow and survive!

EVALUATION: The teacher is able to evaluate the students as they interact with their group and participate in class discussions.

EXTENSIONS:

1. A follow up activity could include a nature walk to look for seeds, noting how many different kinds and how many seeds are found. For added fun in the fall- put rings of masking tape around wrist and ankles while walking(sticky side out) and see all of the seeds you will collect.

2. This would be a good time to have the students plant seeds. Acorns would be ideal but they take a long time to germinate. Flower seeds will give quicker results. Just make sure all five elements are included.

3. The students may want to have a special ceremony and plant an oak tree on the school property for future seeds.

DROUGHT

EATEN BY DEER

FLOOD

POOR SOIL

FIRE

SUNLIGHT

ACORN MIX-UP WORD CARDS

WARM
SPRING
DAYS

WATER

GOOD SOIL

ACORN

THE CASE OF THE MYSTERIOUS ROCKS

SUBJECTS: Science, Language Arts, and Art

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5 and 6

ACADEMIC EXPECTATIONS: Make sense of various messages in which they listen; organize information and use of classification rules and systems; write using appropriate forms for different audiences and purposes; make sense of and communicate ideas with the visual arts; understand scientific ways of thinking and working; understand conditions of nature; create works of art to make presentations; analyze their own and others' artistic products; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; use creative thinking skills to develop ideas or products; organize information to develop or change their understanding of a concept; connect knowledge and experiences from different subject areas; and expand their understanding of existing knowledge.

DURATION: One class period of 30-45 minutes

GROUP SIZE: One or two classes of 15-60 students

SETTING: Indoors or outside with tables or clipboards

KEY VOCABULARY: habitat, resource management, geologist, biologist, casings, environment

ANTICIPATORY SET: Look what's been found! Does anyone know what these are? Does anyone know where they came from?

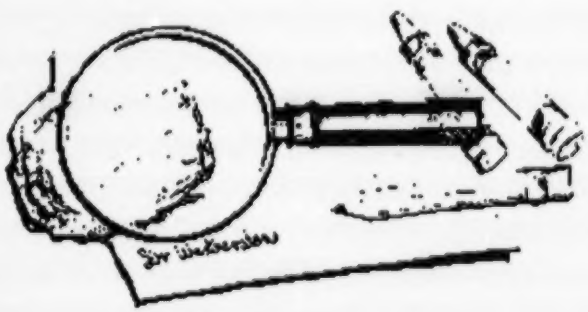
OBJECTIVES: The students will be able to: 1) think critically and creatively to develop a habitat for their "animal;" 2) expand their existing knowledge and develop new knowledge pertaining to habitats.

MATERIALS:
- Pencils
- Crayons
- Dr. Weatherstone's letter
- Rock data sheets
- "Mysterious rocks" (see instruction sheet)

BACKGROUND: A habitat is the place a plant or animal lives and grows. It is "home" to a specific species. All plants and animals have certain requirements to exist. The most important requirements include: food, clean water, clean air, shelter, and living space.

Science and Resource Management is a division of the Mammoth Cave National Park staff. Their job is to record information pertaining to our cultural and scientific past as well as speculating what the future holds. These scientists monitor and record changes in the habitats of plants and animals and the causes of these changes.

Habitats found within Mammoth Cave National Park include: the forest, ponds, areas near a pond, the Green River, fields and meadows, springs, sinking streams, sinkholes, caves, and the underground river systems inside the caves.



PROCEDURE:

1. The teacher explains how these mysterious "rocks" were found on the doorstep of the Science and Resource Management office at Mammoth Cave National Park. The scientists were not sure where they came from, but a note was found with the "rocks". The author of the letter, Dr. Weatherstone, has asked for help from other scientists. The teacher reads the letter to further explain the situation.

2. The teacher asks the students what the word habitat means and writes their answers on the blackboard. Make certain the list includes the requirements for a habitat: food, clean air, clean water, shelter, and living space. The teacher asks the students what habitats are found in Mammoth Cave National Park. Habitats are also listed on the board. The teacher reminds the class that the habitats were listed in Dr. Weatherstone's letter.

3. The teacher passes out a "rock" to each student. The students can work individually or in small groups. The students take a few minutes to examine their "rock." They might want to roll it or shake it. The students should take a few minutes to think about what animal might live in their "rock". The teacher asks the students to pick a home their animal may inhabit within Mammoth Cave National Park: the river, the cave, a field, the forest or any other area.

4. The teacher passes out crayons, pencils, and rock data sheets. The students are asked to draw a picture of their animal and its habitat – remember it can be real or imaginary! If the students create an imaginary animal, they have made a new discovery within the park. After they have drawn their animal in its habitat they can begin to write a short story describing how and where the animal lives. Don't forget to include how the animal obtains food, clean water, clean air, finds shelter and living space.

5. When the students are finished they can share their pictures and stories with each other. The teacher may wish to collect them and put them together in a class book for the students to read and share later.

CLOSURE: Every living creature has basically the same requirements to survive. The animals from our "rocks" need the same things that plants need to grow and the same things that people need to live a healthy life. We find these things in the habitats we call home.

EVALUATION: The teacher is able to evaluate the student's understanding of habitat and creativity by reviewing their story and drawing. Their knowledge is revealed by sharing their stories with their classmates.

EXTENSIONS:

1. This same activity could be done with "seeds" and the students would then develop a habitat for plants.

2. The students could write a short story on the important things they need to survive in their own habitat.

3. The students could pick another habitat, such as a desert, the ice cap, or the moon and describe how their rock animal would be able to survive there.

ROCK DATA SHEET

Name _____

University of Rocks and Erosion
"Caput Lithos"
1000 Pebble Avenue; Boulder, Kentucky 44444; Phone (555) 758-0000 ext. 134 FAX (555) 758-0001

School Year

Mammoth Cave National Park
Science and Resource Management Office
Mammoth Cave, Kentucky 42259

Dear Mammoth Cave National Park Rangers:

I have been very excited about my research project in the park. Our agreement was that I could obtain a permit to collect and study unusual rocks found within Mammoth Cave National Park. After I had studied them, all of my samples had to be returned to the Science and Resource Management Division of the park, where they could be put in a museum display.

Well, last night a very strange thing happened – I had my rock samples sitting in my collection basket. I was relaxing and reading Journey to the Center of the Earth when I heard a loud crack. I jumped up only to discover a strange little creature that took off under my bed. On my way to investigate something in the basket caught my eye. One of the rocks – or as I had thought, rocks – had cracked open. The pieces were everywhere. That little creature had come from the broken casing.

I am sorry to inform you that I am giving up my research for the time being. I am a geologist who studies rocks; NOT a biologist who studies living things. I do hope you are able to find someone to help you with these samples. Please remember that I collected them from all over the park; in the forest, near the pond, in the pond, from the Green River, from some of the fields and meadows, in a spring, from a sinking stream, from a sinkhole, in the cave, and even from the underground river inside the cave. I had notes on each rock, but that creature gobbled down my notebook and all my notes.

I hope to see your results. I will contact you soon about other possible work. But for now, I need to rest after last night's ordeal.

B. G. Weatherstone

Dr. Beauregard G. Weatherstone
University of Rocks and Erosion

MAKING THE MYSTERIOUS ROCKS

P.S. I would check bunkhouse number two before allowing anyone else to stay in it.

MATERIALS:

- Plastic Easter eggs or Leggs eggs
- Masking tape
- White glue
- Brown paper towels

- Popcorn kernels
- Rice
- Screws
- Marbles
- Macaroni
- Nuts
- Washers
- Paper clips
- Other small items

PROCEDURE:

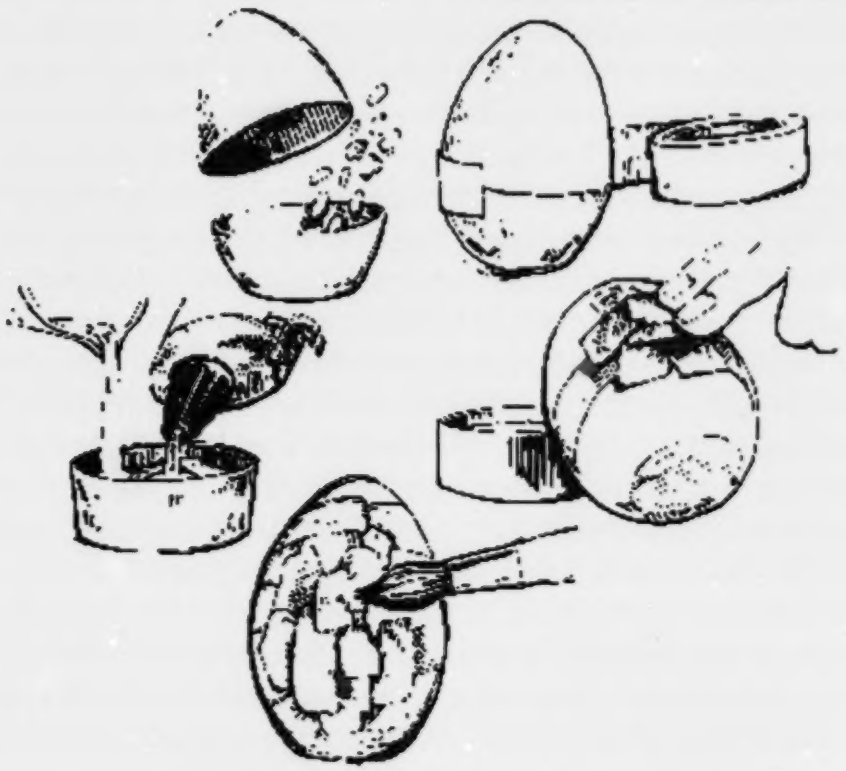
1. Fill each egg with a different item or combination of items from the list at left.

2. Seal each egg with masking tape.

3. Mix white glue with a little water to dilute.

4. Tear paper towels into small pieces. Dip the paper into the glue and water mixture and cover the eggs, just like papier mâché. Completely coat the egg with paper. Set the eggs on a plastic bag overnight to dry.

5. You can paint the new rocks if you desire.



CURRENT SONG

SUBJECTS: Music, Language Arts, Art, and Social Studies

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: Make sense of the various messages to which they listen; make sense of communicated ideas with visual arts; make sense of communicated ideas with music; observe, analyze, and interpret human behaviors, social groupings, and institutions; recognize, apply, and understand the relationship between people and geography; create works of art and make presentations; analyze their own and others' artistic products; show that they understand how time, place, and society influence the arts and humanities; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; creative thinking skills to develop ideas or products; connect knowledge and experiences from different subject areas; use what they already know to acquire new knowledge, skills, or interpret experiences; and expand their understanding of existing knowledge.

DURATION: One class period of 30 to 45 minutes

GROUP SIZE: One class of 25-35 students (or less)

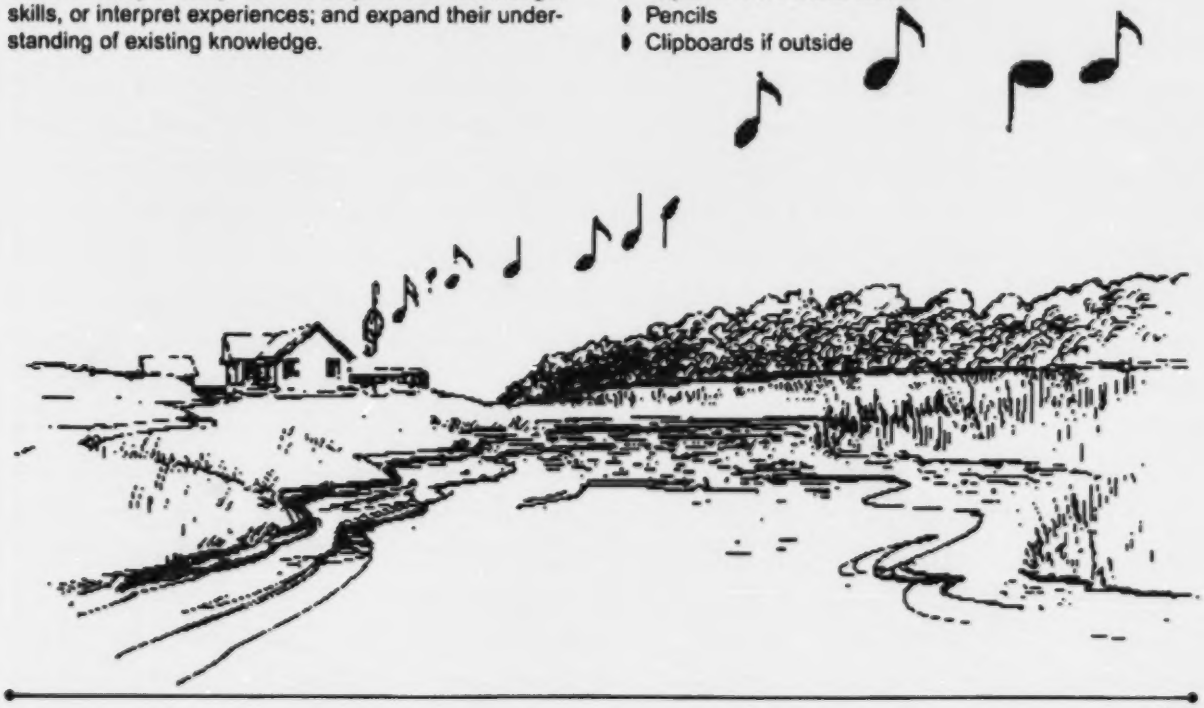
SETTING: Indoors, or outside with clipboards

KEY VOCABULARY: music, lyrics, traditions, bluegrass

ANTICIPATORY SET: Words often have more than one meaning. Today we are going to listen to a "Current Song." Does anyone have any idea what the song may be about?

OBJECTIVES: The students will be able to:
1) listen to music and identify a feeling or mood; 2) work independently to illustrate a lyric from *Paradise*.

MATERIALS:
- Tape recorder
- Recording of *Paradise* by John Prine
- Tape of bluegrass music
- Lyric sheets
- Paper or 5 x 7 index cards
- Pencils
- Clipboards if outside



CURRENT SONG

BACKGROUND: Music is a very common way for people to express their feeling about a place that holds a special meaning. Rivers, including the Green River, have inspired many song writers.

Bluegrass music, a southeast style of music, has a long history. Many people believe that the foundations to this style originated in the Old World, in the British Isles including Ireland and Scotland. In the southeast United States its roots started in the 1940's. The basic principles of the music were fully developed by 1945, when Earl Scrugs joined Bill Monroe's band. Bill Monroe is considered the "Father of Bluegrass music." Bill Monroe and his band, the Bluegrass Boys, played at the Grand Old Opry. As the music gained in popularity and made its way onto radio a name was needed for this new sound. Bluegrass was labeled as a style of music in the 1950's. This music is famous for its lead instruments playing the melody. Lead instruments include the fiddle, mandolin, and five string banjo. The rhythm instruments include acoustic guitar and bass. Voice is characterized by high harmony singing which includes a high tenor part. Some refer to this tenor part as a high lonesome sound. The higher male voice gave bluegrass its distinction and intensity. Bluegrass is also known for giving instrumentalists or voices a chance for improvisation as they go along.

Bluegrass, like most types of music, has floated in and out of popularity. In the 1960's the tv show, the *Beverly Hillbillies* and movies such as *Bonnie and Clyde* and *Deliverance* brought bluegrass out into the "pop culture." The "folk revival" of the 1960's helped to keep Bluegrass in the "pop culture" for over a decade. In the seventies, new artists began to combine rock & roll and bluegrass. The traditional Bluegrass performers did not quickly accept the new style until the early 1980's.

In the mid-1980's the International Bluegrass Music Association originated. Bluegrass today is enjoyed by millions of people in the United States and in dozens of foreign countries including Russia, Japan, Europe, Australia, and Canada. Bluegrass is programmed on more than 900 radio stations worldwide. Over 500 Bluegrass festivals are held throughout the United States every year, one of which is the Bluegrass festival in Owensboro, Kentucky. For more information on Bluegrass music or festivals contact the International Bluegrass Music Association Office in Owensboro, Kentucky at (270)684-9025.

PROCEDURE:

1. After discussing the meanings of "current" the teacher tells the students that they are going to listen to a song (*Paradise*) about a river that flows through their own "backyard."

2. The teacher asks the students to listen closely to the song and notice how it makes them feel. Students should write down any lyrics or phrases that really catch their attention. The teacher asks, "Do any of the lyrics remind you of places or parts of Kentucky?"

3. The teacher plays *Paradise* by John Prine. After listening to the song (the students may want to hear it twice), the class discusses how the music may have made them feel. After discussing these feelings the class makes a list of lyrics, phrases or words that stand out, meant something to them, or reminded them of parts of Kentucky.

4. The teacher has the students pick a line of the song from a hat. The students work independently to draw a picture demonstrating the meaning of their line. The students will need to write their line at the bottom of their page. While the students work, the teacher plays a tape of various bluegrass songs.

5. In the order of the song, the students stand-up, read their lyric, and show their picture.

6. The teacher collects the pages and puts them together in a class book, to be shared throughout the year.

CLOSURE: Just like words have more than one meaning, music can have its own meaning to each person who listens to it. Our pictures help to illustrate how the lyrics we selected are special to each of us.

EVALUATION: The teacher evaluates the students through class discussions and by reviewing the students' drawings.

EXTENSIONS:

1. The students could work in groups to write a song about water, including topics such as water pollution, the need for water, the sounds of water, or water habitats.

2. The students could work in groups to find another song that addresses another unique resource and demonstrate why it is important to people.

3. The class could take a trip to the Green River. While sitting on the bank next to the river the students could write about the water's natural music and express how it makes them feel by writing their own lyrics or a poem.

PARADISE

– John Prine

When I was a child, my family would travel
Down to Western Kentucky, where my parents were born
And there's a backwards old town, that's often remembered
So many times that my memories are worn

[Chorus:]
And daddy won't you take me back to Muhlenberg County
Down by the Green River where Paradise lay
Well I'm sorry my son, but you're too late in asking
Mr. Peabody's coal train has hauled it away

Well sometimes we'd travel right down the Green River
To the abandoned old prison down by Adrie Hill
Where the air smelled like snakes and we'd shoot our pistols
But empty pop bottles was all we would kill

[Chorus.]

Then the coal company came with the world's largest shovel
And they tortured the timber and stripped all the land
Well, they dug for their coal till the land was forsaken
Then they wrote it all down as the progress of man

[Chorus.]

When I die, let my ashes float down the Green River
Let my soul roll on up to the Rochester Dam
I'll be halfway to heaven with Paradise waiting
Just five miles away from wherever I am

[Chorus.]

Paradise
John Prine

Paradise © 1971 WALDEN MUSIC, INC. & SOUR GRAPES MUSIC
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CLEAR AS MUD

SUBJECTS: Science, Social Studies, Career Education, Mathematics and Health

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: Use reference tools and research tools; make sense of the variety of materials they read; make sense of the various things that they observe; use mathematical ideas and procedures; organize information and use of classification rules and systems; understand scientific ways of thinking and working; identify, analyze, and use patterns; identify and analyze systems; use the concept of scale and scientific models; understand conditions of nature; understand change over time; understand and use number concepts; understand and use various mathematical procedures; understand and use measurement concepts; understand and use statistics and probability; demonstrate the skills to evaluate and use services and resources available in their community; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; use critical thinking skills to solve a variety of problems in a real-life situation; organize information to develop or change their understanding of a concept; use a decision-making process to make informed decisions; connect knowledge and experiences from different subject areas; use what they already know to acquire new knowledge, skills, or interpret experiences; and expand their understanding of existing knowledge.

DURATION: One class period of 30-45 minutes or longer

GROUP SIZE: One class of 25-30 students (or less)

SETTING: Indoors

KEY VOCABULARY: Pollution, chemical, organic, ecological, point and non-point source pollution, ground water, runoff, watershed, karst, turbidity and boundaries

ANTICIPATORY SET: Have you ever thought about what affects the water we drink? Many things that happen in our community or in surrounding areas may affect our drinking water either directly or indirectly. Maybe some of the things we do around our homes affect our water.

OBJECTIVES: The students will be able to: 1) recognize the different kinds of pollution that affects water; 2) define turbidity and non-point source pollution and discuss how they relate to their water samples.

MATERIALS:

- Three different colors of construction paper– blue, gold (or brown), and red. Use two sheets of each to make tokens (Note: we purchased sequins in the various colors to avoid hole punching)
- Graph paper
- Crayons/colored pencils
- Paper punch
- One teaspoon measure (for paper punch tokens)
- One tablespoon measure (if 1/2 inch tokens are chosen)
- Two empty wide mouth peanut butter jars
- Wax paper and Saran Wrap
- "Clear As Mud Research Forms"

CLEAR AS MUD

BACKGROUND: All of the water that has ever been available is on the earth right now. In some of your studies you may have come across information stating that we are drinking the same water the dinosaurs did millions of years ago. In many ways this is true. The same water is just recycled over and over.

Here is an interesting analogy of the biosphere's hydrologic cycle. If all water in the world were equal to 1,000 gallons, we would find approximately 971 gallons in the oceans and seas, 20 gallons in the ice caps and glaciers, 6 gallons underground, 2 gallons in the atmosphere, 1 quart in fresh water lakes, 1 cup suspended in the soil, and 1 teaspoon in our rivers. With this analogy in mind, it is apparent how fragile this vital resource is. Yet each day we hear about water being damaged by pollution. Sometimes pollution stresses ecosystems beyond their capabilities to support life.

Pollution is a complex topic. These are the three kinds of pollution affecting the Green River and other bodies of water in our area. They are:

Chemical Pollution: the introduction of toxic substances into an ecosystem, e.g., contamination of a water supply by pesticides, or toxic spills from railroads and interstates. Hydrologists believe toxic spills to be a greater threat to water quality than pesticides. This is particularly true in the Mammoth Cave area because of the karst terrain (an area characterized by many sinkholes and disappearing streams which quickly carries water plus its pollutants underground). Most of the water in this area comes from groundwater (water that is found underground, in the layers of soil and bedrock.)

Organic Pollution: over-supplying an ecosystem with organic material such as bacteria or nutrients, e.g., agricultural fertilizer.

Ecological Pollution: stresses ordinarily created by natural processes, e.g., abnormal increase in sediments in runoff producing large quantities of silt. This can be caused by heavy logging, leaving no roots to hold the soil in place, construction, and some farming practices.

For the most part, pollution is invisible; it usually takes a great deal of time to exhibit its impact. Turbidity is the exception. The definition of turbidity is: the degree of cloudiness due to material suspended in water. "Turbidity is the result of suspended solids in the water. Turbidity is the opposite of clarity. At higher levels of turbidity, water loses its ability to support a diversity of aquatic organisms. Waters become warmer as suspended particles absorb heat from sunlight proportionate to the concentration of particles. Remember, warm water holds less oxygen than cooler water. Less light penetrating the water decreases photosynthesis, which in turn reduces oxygen concentrations. Suspended solids may clog fish gills, reduce growth rates and decrease resistance to disease, as well as preventing egg and larval development. Particles of silt, clay, and organic materials may settle to the river bottom, especially in impounded and slow-moving rivers. These settled particles can accumulate and smother eggs of fish and aquatic insects resting on the river bottom" (*Field Manual for Water Quality Monitoring*, Mitchell & Stapp, 1988). Turbidity has the greatest impact on the health of water in the Mammoth Cave area. This is due, almost entirely, to soil erosion.

Groundwater is continually being affected by pollution. Some pollution enters water from a localized source, such as a factory, and is quite easily traced. This is called **point source pollution**. Other pollution enters from a variety of less traceable sources. For example, when rain washes over fields, forest floors, meadows, and rock outcroppings, carrying sediment into a water source. This is called **non-point source pollution**. Non-point pollution is the most common source of pollution in the Mammoth Cave area.

Hydrologists are people who study water. In the Mammoth Cave area hydrologists study the way water travels in the watershed (a region or area that drains into a body of water). In its meandering, water may be contaminated in various ways. In many instances water is altered to the extent that it becomes a hazard to wildlife, wildlife habitats, and humans.

PROCEDURE:

1. Before the activity begins, make tokens out of construction paper (using a paper punch) or purchase sequins. For the **first** water sample (Jar #1), make 1,960 blue tokens (representing water), 40 red tokens (representing other pollutants such as chemical or organic pollution), and 400 gold tokens (representing sediment, ecological pollution). For the **second** water sample (Jar #2) make 970 blue, 70 red and 1,360 gold. (If you feel your students would do better with larger tokens, you may want to cut 1/2 inch squares instead of using a paper punch.) Stir them so all the colors are **thoroughly mixed**. Make copies of the Clear As Mud activity sheets for each group (class will be divided into groups of two or three) as well as an extra teacher copy.

2. List the three major categories of pollution (chemical, organic and ecological) on the chalkboard and discuss each. Refer to the information section for a description.

3. Divide the class into groups of two or three. Each group will be acting as a research team and will analyze two samples of water from the Echo River Spring. This spring is one location where water exits Mammoth Cave and flows into the Green River. The teacher distributes the Clear As Mud activity sheets at this time.

4. Distribute the colored paper tokens of sample one, by having one member of each group measure 1 teaspoon of the paper punched tokens or 1 tablespoon of the cut 1/2 inch square tokens from Jar #1.

5. Instruct students to separate the colored tokens into different piles, according to color. Once this is done, they should count the number of each color and use crayons/colored pencils to fill in the bar graphs on their activity sheet. The units per sample (number of each color) should go up the side and the components (three different elements found in the sample; water – blue, sediment – gold, and other pollutants – red) across the bottom. This will make it easier to compare each team's findings. Remind the class that each group has taken a sample from a slightly different location of Echo River Spring and at a slightly different time. Samples will be similar but not identical. All samples are carefully returned to the jar. Remind the students that in a "real" water sampling the sample would not be returned to the jar.

6. After the bar graphs are completed, compare each team's results and record them on the blackboard. Then repeat the same process with sample two. What is different? Why? The teacher reminds the students that they are sampling from the same location. After discussion, students should be able to identify that the second sample was taken on a different day. The teacher asks, "What speculations can you make about this particular day?" The students should make the correlation between rain, and erosion. More sediment has been added to the water because of a change in weather. This additional sediment has increased what is referred to as turbidity or the cloudiness of the water. If the water has higher turbidity levels that means more sediment or dirt is in the water making the water cloudy so less light is able to travel through. Is that good or bad? How? Is it pollution? What kind?

7. The teacher defines turbidity as: the degree of cloudiness due to material suspended (held) in the water. Turbidity is measured by how much light can travel through a water sample. The teacher shows the students a piece of saran wrap and a piece of wax paper. Which of the two would have a higher degree of turbidity? The student's answer should be the waxed paper.

8. Discuss how natural elements are considered to be pollution when the elements' presence are out of balance with the natural order. Discuss how runoff into sinkholes, from forest, field, meadows etc. can travel into the water, thus changing the health of the water. Because water in this region comes from such a vast area (60,000 acres) it is difficult to pinpoint the exact source of pollution. This would be called non-point pollution.

9. The students work in groups to complete their activity sheets. The class can discuss the answers as they finish.

CLOSURE: Water is a resource that wildlife and humans must have to survive. In our area of Kentucky, the lack of water has rarely been a problem. The quality of the water rather than the quantity should be our concern.

EVALUATION: The teacher is able to evaluate the students by observing their interaction while working in groups and by observing the bar graphs and activity sheets of each group.

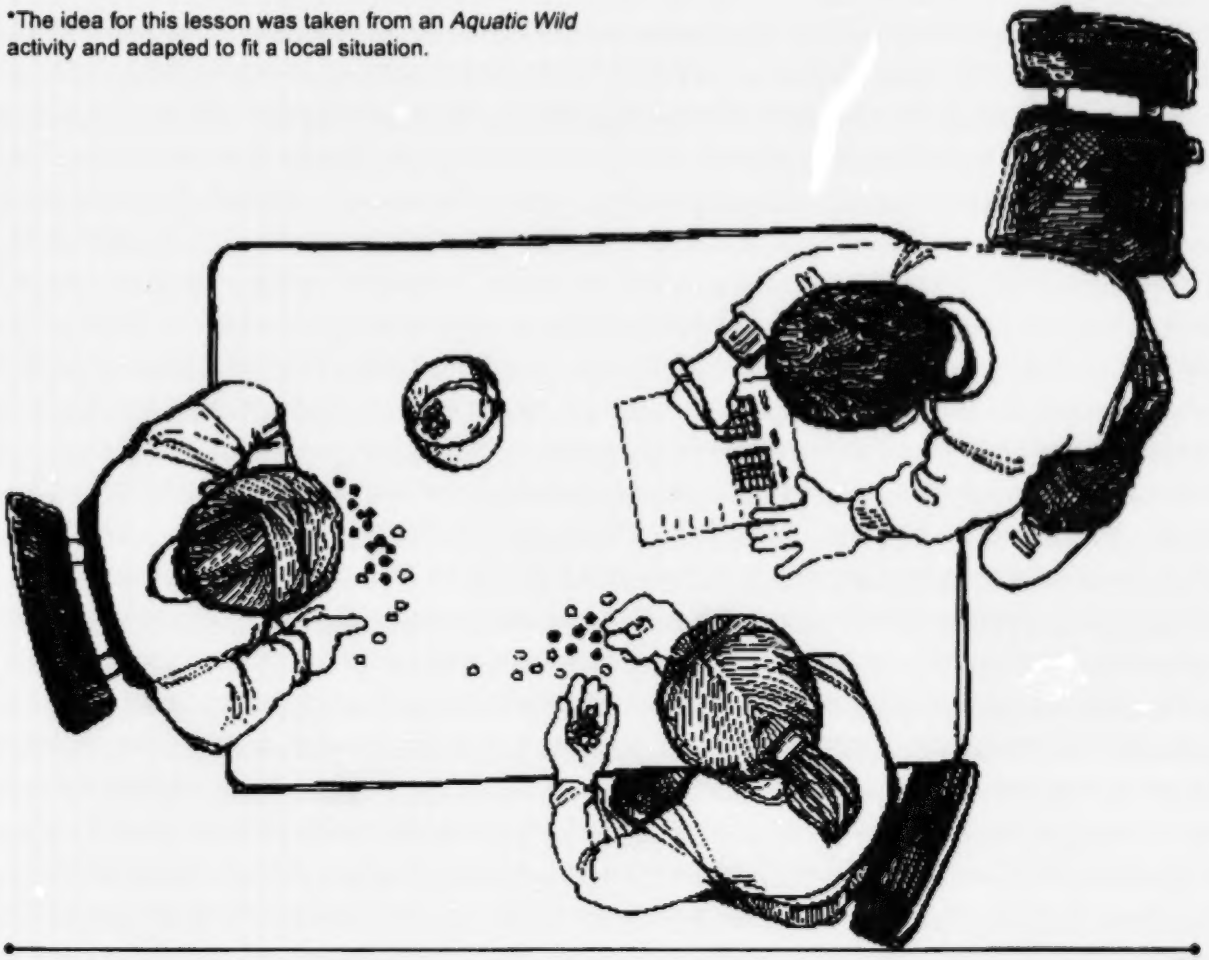
EXTENSIONS:

1. The students could research the current national and state laws protecting water quality in Kentucky and the U. S. The students could write a short history of the U. S. Clean Water Act.

2. The students could invite a quest speaker from a local agricultural, conservation or other similar agency to speak about what their organization is doing to protect water.

3. Students could travel to a stream or river to collect water and test it for various elements such as pH or dissolved oxygen.

*The idea for this lesson was taken from an *Aquatic Wild* activity and adapted to fit a local situation.



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CLEAR AS MUD RESEARCH FORM

Research Team:_____

Pollution is a complex topic. There are three kinds of pollution affecting the Green River and other bodies of water in our area. They are:

Ecological Pollution: stresses ordinarily created by natural processes, e.g., abnormal increase in sediments in runoff producing large quantities of silt.

Chemical Pollution: the introduction of toxic substances into an ecosystem, e.g., contamination of a water supply by pesticides, or toxic spills from railroads and interstates. Hydrologists believe toxic spills to be a greater threat to water quality than pesticides. This is particularly true in the Mammoth Cave area because of the karst terrain (an area characterized by many sinkholes and disappearing streams which quickly carries water plus its pollutants underground).

Organic Pollution: over-supplying an ecosystem with nutrients, e.g., agricultural fertilizer.

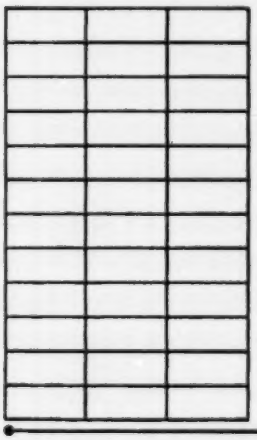
DIRECTIONS:
In a few minutes you will be taking a sample of water collected from the Echo River Spring. As a team you will need to measure the components of the sample which include: water (blue dots), ecological pollution= silt and sediment (gold dots), and other pollutants= chemical and organic (red dots). As in all research, it is important to be precise and accurate.

To set up your graph: to the left side of each graph you will put the number of units by 10 (0, 10, 20, 30, etc.) going up. Across the bottom you will list what you found in your sample (water, sediment, other pollutants). After you have counted the parts of your sample and prepared your graph, color in the rows with crayons or colored pencils.

Sample 1.

Sample Time:_____

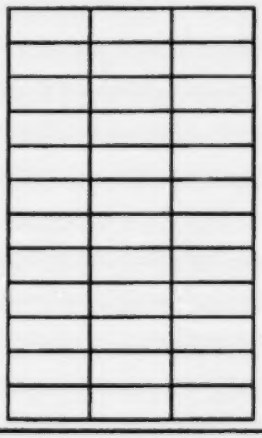
Collector:_____



Sample 2.

Sample Time:_____

Collector:_____



CLEAR AS MUD RESEARCH FORM

1. Was there a big difference between sample one and sample two?

If so, what was it? and why do you think it occurred?

2. We have talked about turbidity being the amount of sediment in water. The higher the amount of sediment the less light that can pass through the water. If we were to compare saran wrap and wax paper to our samples –

Sample One would be more like _____

Sample Two would be more like _____

3. Write a definition and give and example for each of the following:

Point source pollution –

Non-point source pollution –

4. Name three problems that high turbidity could cause to a river ecosystem.

1.

2.

3.

KENTUCKY CAPSULES

SUBJECTS: Social Studies, Science and Language Arts

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: Make sense of a variety of materials they read; make sense of various messages to which they listen; organize information and use of classification rules and systems; speak using appropriate forms for different audiences and purposes; identify, analyze, and use patterns; observe, analyze, and interpret human behaviors, social groupings, and institutions; understand, analyze, and interpret historical events; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; use critical thinking skills to solve a variety of problems in real-life situations; organize information to develop or change their understanding of a concept; use a decision-making process to make informed decisions; connect knowledge and experiences from different subject areas; use what they already know to acquire new knowledge, skills, or interpret experience; and expand their understanding of existing knowledge.

DURATION: One class period of 35-45 minutes

GROUP SIZE: One or two classes of 8 to 60 students

SETTING: Indoors

KEY VOCABULARY: Time line, past, chronological order, and capsule word list

ANTICIPATORY SET: Today we are going to look at several "capsules" of time. Every generation has unusual events that make their time period original. In each of our "capsules" there are special happenings from a particular era.

OBJECTIVES: The students will be able to: 1) identify a time period by using key words; 2) arrange time periods from oldest to youngest; 3) think logically and express thoughts orally.

MATERIALS:
- One bag of large lima or great northern beans
- a fine tip felt pen
- clear nail polish
- eight or more empty film canisters
- time period signs
- time period description cards.

BACKGROUND: Kentucky's history is diverse and begins even before human presence in the south central area of the state. Many of the interesting and unusual historical events of Kentucky and Mammoth Cave are not found in traditional text books. We have chosen eight of the more interesting topics dealing with Kentucky and Mammoth Cave history for you and your students to investigate. (See time period description cards.)

PROCEDURE:

1. The teacher places the students into eight groups of two or three students (to have the students work in smaller groups the teacher may wish to make duplicates of several capsules). The teacher then reads the eight time period signs before placing them on the blackboard. The signs should **not** be read or placed in chronological order.

2. Each group is given a capsule (film canister). They are told that their capsule matches one time period. All the words are different clues representing only one time period. They are not to try to match a bean per time period! Each time period has 6 "bean clues" to help reveal the conclusion. The students can open their capsules and look at their words.

3. While the students are looking at their words the teacher can wander around the room to answer questions or help with unfamiliar words.

4. When the groups seem to know their matches, the teacher can ask for a group to volunteer to go first. The students read the words from their capsule. The teacher writes these words on the black board. Then the group announces which sign they think the words match. (If using more than one of each capsule to have smaller groups, the teacher can ask if any other group has the

same words and asks if they agree with the first group.) The teacher asks the group why and if anyone else agrees or disagrees. This will lead to discussions as each group announces their findings.

5. Once all of the capsules have been matched to the signs, the teacher lets the students know the signs need to be in chronological order. We start with the oldest event at the left end of the blackboard and works toward the youngest event to the far right. The teacher asks, "Who thinks they have an idea of what happened first?"

6. As each sign is selected to be put in order, the teacher gives the group with the matching time capsule the matching time period description card to read. The teacher encourages the students to look for words that were read from the capsules that might help them choose the next sign.

7. After the signs are placed in order, the teacher asks the students, "What if we made a time capsule for today? What words could we include and what would our sign say?" After listing ideas on the board the teacher can collect the students' materials.

CONCLUSION: Different times throughout our history can be captured in a few words to represent major events. These events help to make each time period unique.

EVALUATION: The teacher is able to evaluate the students as they work with their time capsules as well as through their class discussion.

EXTENSIONS:

1. This could lead to a writing activity, where the students have discovered a container and in it they found ... from ...time period. The students fill in the blanks and provide a description of an era.

2. The students could create a time capsule that would represent the special things that have happened during their school year. These capsules can be saved to be opened by next year's class.

3. The students could visit a museum, such as the Kentucky Museum in Bowling Green, the American Cave and Karst Museum in Horse Cave, or the South Central Cultural Center (formerly Museum of the Barrens) in Glasgow to see how museums are time capsules capturing special times and ways of life.

THE CAVE BEGINS TO FORM

According to geologists, millions of years ago Kentucky was covered by a shallow, warm **sea**. Deposits from this **sea** created layers of **limestone** that would later "house" the world's longest cave. Over time the **sea** moved to the south as glaciers from the north began to melt. The melting glaciers created a **river** that carried a large amount of sand and sediment. After a great deal of time passed, the sediments from this river formed layers of **sandstone** on top of the **limestone**. Later cracks and **sinkholes** formed allowing water containing **carbonic acid** to make its way to the **limestone**, creating Mammoth Cave.

PREHISTORIC PEOPLE IN THE CAVE AREA

The first people to enter Mammoth Cave made their way through dark passages with **cane reed** torches. They wore only a breach cloth and **slippers** as they traveled through the cave. These people used **mussel shells** to scrape **minerals** from the cave walls. **Gourds**, used as utensils, have also been found in the cave. Much of our information is known from the discovery of **mummies** of these ancient people.

WESTWARD EXPANSION INTO KENTUCKY

The Appalachian Mountains blocked the way of westward expansion until **early settlers** discovered an opening through the mountain chain. Later this opening was named the **Cumberland Gap**. In **1792** when Kentucky became a state, it was considered to be the **wild west**. These early pioneers lived in **log cabins** and were called **longhunters** because they traveled long distances and were gone for long periods of time.

THE WAR OF 1812 HITS HOME

In 1812 the United States fought a war **against England**. The powerful English Navy blockaded our sea ports and our country could no longer import **gun powder**. At that time early pioneers knew **cave dirt** contained **saltpetre**, the main ingredient needed to make **gun powder**. Many **slaves** worked in Mammoth Cave processing the dirt. Pumps and **hollow logs** (used as pipes) took the liquid mixture from the cave for final processing.

DR. CROGHAN – EXPLORES OTHER POSSIBILITIES

Dr. John Croghan of Louisville, Kentucky was one of the early private owners of Mammoth Cave. In the mid-1830's **tuberculosis** (an ailment affecting your lungs) was a fatal disease. One part of Dr. Croghan's plan was to try an **experiment** in the cave to **cure** this illness. He actually built an underground hospital for 15 patients. The second part of his plan was to build **a hotel** in the cave, continue **cave tours**, and make Mammoth Cave a more famous **tourist attraction.**

KENTUCKY CAVE WARS

The 1920's were a time of great **competition** in the Mammoth Cave area. **False advertising** and **trickery** was common on the route to Mammoth Cave to entice people to visit other caves. **Private owners** posted **road signs** or stationed people along the roads to Mammoth Cave. The most famous cave explorer of the time was **Floyd Collins** who lost his life in Sand Cave. Floyd was searching for the first cave entrance on the road from Cave City.

JESSE JAMES STRIKES AGAIN

In **1880**, **Judge** Roundtree and his daughter were visiting Mammoth Cave. That evening the **judge**, his daughter, and other visitors boarded a **stagecoach** for **Cave City**. On their way through a wooded area their **stagecoach** was stopped by a band of men carrying **guns**. They demanded everyone's money and other valuables. The **judge** was forced to give up his **pocketwatch**. The engraved watch was found a few months later on the slain body of the notorious outlaw, Jesse James.

MAMMOTH CAVE – A NEW NATIONAL PARK

After many years of private ownership Mammoth Cave became a National Park in **1941**. **Visitors** from all over the world come to see this special place. **Rangers** work very hard to protect the **wildlife, vegetation** and unique **landforms** found in Mammoth Cave National Park. National parks are believed to contain our nation's greatest treasures.

CREATING THE CAPSULES

1. With a fine felt tip or permanent marker, print the time period words on large lima or Great Northern beans, one clue per bean.
2. After the marker has dried, paint over the words with clear nail polish.
3. After the nail polish has dried fill each film canister with a time period's beans.

TIME PERIODS WORD LISTS

1. The Cave Begins to Form

Sea
Sandstone
Limestone
Sinkholes
River
Carbonic Acid

2. Prehistoric People in the Cave Area

Cane Reed
Minerals
Slippers
Gourds
Mussel Shells
Mummies

3. Westward Expansion Into Kentucky

Early Settlers
Wild West
Cumberland Gap
1792
Log Cabins
Longhunters

4. The War of 1812 Hits Home

Against England
Slaves
Gunpowder
Saltpetre
Cave Dirt
Hollow Logs

5. Dr. Croghan Explores Other Possibilities

Tuberculosis
Experiment
Hotel
Tours
Tourist Attraction
Cure

6. Jesse James Strikes Again

1880
Cave City
Judge
Guns
Stagecoach
Pocketwatch

7. Kentucky Cave Wars

Competition
False Advertising
Private Owners
Trickery
Road Signs
Floyd Collins

8. Mammoth Cave – A New National Park

1941
Wildlife
Visitors
Vegetation
Rangers
Landforms

The Cave Begins to Form

Prehistoric People in the Cave Area

Westward Expansion Into Kentucky

The War of 1812 Hits Home

Dr. Croghan Explores Other Possibilties

Jesse James Strikes Again

Kentucky Cave Wars

Mammoth Cave — A New National Park

IN REMEMBRANCE

SUBJECTS: Social Studies and Language Arts

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: Use reference tools and research tools; make sense of the variety of materials they read; make sense of the various things they observe; write using appropriate forms for different audiences and purposes; make sense of and communicate ideas with the visual arts; observe, analyze, and interpret human behaviors, social groupings, and institutions; interact and work with many ethnic and cultural groups; recognize, apply, and understand the relationship between people and geography; understand, analyze, and interpret historical events; create works of art and make presentations; analyze their own and other's artistic products; show that they understand how time, place, and society influence the arts and humanities; show their abilities to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; use critical thinking skills to solve a variety of problems in a real-life situation; use creative thinking skills to develop ideas or products; use a decision making process to make an informed decision; connect knowledge and experiences from different subject areas; use what they already know to acquire new knowledge, skills, or interpret experiences; and expand their understanding of existing knowledge.

DURATION: One class period of 25-35 minutes

GROUP SIZE: One classroom of 25-35 students (or less)

SETTING: Indoors or outside with clipboards

KEY VOCABULARY: Tombstone, Stephen Bishop, Union soldier, epitaph, symbol

ANTICIPATORY SET: Today we are going to talk about a very special cave guide. Has anyone heard of Stephen Bishop?

OBJECTIVES: The students will be able to: 1) work independently to create a symbol that best describes Stephen Bishop; 2) produce a creative writing project in the form of a letter.

MATERIALS:

- Black and white photos or an overhead tansparency of Stephen Bishop's tombstone
- fifth grade report
- activity sheets
- clipboards
- pencil
- crayons

BACKGROUND: Stephen Bishop was a famous cave guide from 1838 to 1857. His popularity even spread overseas. People would travel for hundreds of miles to see Mammoth Cave. When visitors arrived they would often request Stephen to be their guide. Stephen was well known for exploring over 20 miles of cave passageways, being the first to cross the Bottomless Pit and also the first to see the Echo River and its eyeless cavefish. Stephen Bishop was a slave who worked in Mammoth Cave at the same time that Dr. John Croghan, of Louisville, owned the Mammoth Cave Estate.

When Stephen Bishop died in 1857, his wife Charlotte had very little money. He was buried in what is now called "The Old Guides' Cemetery." It is said that Stephen was buried there to keep a watch on the entrance of the cave. More than 20 years after Stephen's death, a visitor from Pittsburgh, Pennsylvania, arranged for a tombstone to be placed on his grave. The stone was purchased by Mr. Mellon, a well known steel industrialist in the mid- to late 1800's. The stone he purchased was an old Union soldier's headstone. The soldier's name was sanded off and replaced with, "Stephen Bishop, First Guide & Explorer of the Mammoth Cave, Died June 15, 1859 in his 37th year." Stephen was 37 years old but he died sometime in the summer of 1857. The exact date of his death is not known. The symbol at the top of Stephen's grave is the symbol placed on a Union soldier's stone. Stephen was not a soldier during the civil war.

Epitaphs and symbols are often placed on graves to help remember a person. These symbols are selected because they represent what was important to or about that person. Some symbols are commonly used by specific religions, some are used for certain ages, and others are unique for that individual.

PROCEDURE:

1. The teacher gives copies of a report written by a 5th grader about Stephen Bishop. The teacher may wish to have students take turns reading the report aloud, a paragraph at a time.

2. The teacher reviews, with the students, who Stephen Bishop was and how he explored Mammoth Cave. The teacher will want to be sure the students know that Stephen Bishop guided people through the cave.

3. The students will study the black and white photo of Stephen Bishop's tombstone.

4. After the photos are studied the class discusses the symbols they find on the stone. The teacher may wish to ask questions such as, "Would Stephen like the fact that he has a Union flag on his stone? Since Stephen was a famous cave guide what symbol might he have chosen? What symbol did you think Stephen's family might have selected?"

5. The students then look at the words on the stone. The class discusses the epitaph. The teacher may ask questions such as, "How do you think Stephen would feel being called the first guide and explorer?" Note: Stephen was one of the first guides, but many people explored the cave before him. Stephen knew prehistoric people had visited many miles of the cave long before he did.

6. After discussing Stephen's tombstone the students will work on their individual activity sheets. The teacher asks the students to draw a symbol that tells something about Stephen Bishop.

7. The students may choose to share their symbols.

8. The students then complete their writing. The students pretend they are a visitor that just came out of the cave with Stephen Bishop. They are asked to write a letter to a family member or friend about what they have seen and their impressions of Stephen Bishop.

9. The teacher collects the student's work.

CLOSURE: We have studied about a special person today. Families select epitaphs and symbols to represent what was unique about a person.

EVALUATION: The teacher is able to evaluate the students during class discussion and their writings.

EXTENSIONS:

1. The class could visit a cemetery and draw symbols and collect epitaphs. After returning to the classroom, students could compare what they gathered and make conclusions about the various stones.

2. The students could make a family tree. Discuss with their families some of the special memories they or their parents have about older family members and make a family symbol.

3. The students could collect newspaper articles about other famous people and see how they are remembered.

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Stephen Bishop, Cave Explorer

Written by:Jessica Howell, February 2000, 5th grade, Hiseville Elementary School

Mammoth Cave, in Kentucky, is the longest cave in the world. Much of what is known about this great cave is because of Stephen Bishop's exploration.

When he was only 17 years old his master, Mr. Frank Gorin, sent him to Mammoth Cave to be a guide. Mr. Gorin owned the cave and wanted to make money from the tourists. Even though Stephen was sent to the cave on orders he became very fond of the cave.

When Stephen wasn't giving a tour he loved to explore farther into the wild of all of the wildest caves. He was very strong, athletic and brave. This all helped him to be one of the greatest cave explorers in the U.S. and in Mammoth Cave's history.

The first summer he was at Mammoth Cave Stephen squeezed through some narrow passages and came to a deep pit that looked bottomless. This created more interest for him to explore more of Mammoth Cave. Some tourists wanted Stephen to take them into the wildest parts of the cave and he did take them farther into the cave where he had been. Then he took different routes to find other passageways.

One of these visitors was H. C. Stevenson. When the tourists reached the Bottomless Pit they used cedar pole ladders to span the 6 foot mouth of the pit. Just beyond that they jumped a large crack and discovered even more of the cave. As the tourists explored the cave it became more and more different, the floors were damp. Much to their surprise they found an underground river! Stephen and the tourists named it River Styx. The River is now called Echo River, but some of us who are fond of Stephen call it the River Styx.

In later explorations Stephen found new routes from the river shores and discovered other parts of the cave like Mammoth Dome and the Snowball Room. I think it was his dream to discover all of Mammoth Cave before he died.

When wading in the river Stephen discovered the eyeless fish. A permanent cedar bridge was built across the Bottomless Pit and tourism exploded. In 1839 Dr. John Croghan, a doctor from Louisville, Kentucky, bought Mammoth Cave and the famous Stephen Bishop. Dr. Croghan opened a hospital in Mammoth Cave to treat tuberculosis. The doctor thought living in the cave would cure this disease, but the patients died.

In 1842 Stephen was sent to Dr. Croghan's estate in Louisville and he worked for two weeks drawing a map of Mammoth Cave completely from memory. His map showed amazing accuracy. The map was published in 1844 in Bullit's Rambles in Mammoth Cave. Stephen was given full credit for his work which was unusual for a black slave. Stephen did get the map done but he left off some of the Mammoth Cave because he died before he could explore more.

Stephen's tour outfit was a chocolate colored slouch hat, a green jacket, and striped pants. He gave tours that people really enjoyed because of his great wit, charm and knowledge. He was also a hero because he saved a couple of men by carrying them out of the cave. He would take tourists to special parts of the cave if they would teach him something new and learned to write by watching them write their names on the cave walls. Stephen learned four languages and could talk about all kinds of topics. The reason he did this was because slaves weren't supposed to learn to read or write and that is why his master didn't teach him.

Stephen gained his freedom in 1856. His master, Dr. Croghan, died in 1849 and his will said that Stephen could be

freed in 7 years. Stephen planned to return to Liberia, Africa with his wife and son. Stephen wanted to start a new life. He never got to do this because he died that next year in 1857 of some people say a lung disease. Stephen put Mammoth Cave on the map and is called "the Columbus of the underground world."

Stephen was a self-educated man. He had a fine genius, a great fund of wit and humor. With some little knowledge of Latin and Greek, and much knowledge of geology, his greatest talent was his knowledge of man. One of his owners said that Stephen had "talents of the first order. He was trustworthy and reliable and was a hero."

Mammoth Cave's First Guide

The remarkable "Stephen", the first Charon of Kentucky's underworld, was a slave. Stephen is graphically described by Nathaniel P. Willis, one of the men who had the good fortune to view the cave under the protection of the first guide, Stephen Bishop. In describing Stephen the author says

"he is very picturesque...part mulatto and part Indian. With more of the physiognomy of a Spaniard, with masses of black hair, curling slightly and gracefully, and his long mustache, giving quite an appearance. He is of middle size, but built for an athlete. With broad chest and shoulders, narrow hips and legs slightly bowed. Mammoth Cave is a wonder in which draws good society and Stephen shows that he is used to it.

Stephen's intelligent face is assured and tranquil, and his manners are particularly quiet. Stephen talks to charming ladies with the air of a man who is accustomed to their good will and attentive listening.

Stephen is married, he has one boy, takes a newspaper, studies geology, and means to go to Liberia as soon as he can buy his wife, child and self from his present master."

Stephen was married to Charlotte. (We do not know her last name but most of the slaves took the last names of their owner.) In the cave on a wall is written "Stephen and Charlotte forever."

Stephen Bishop Dies

In the 19 years that young Stephen spent at Mammoth Cave, he has always been a tour guide. Stephen died young, and today he sleeps quietly in a woodland spot. Beneath drooping forest trees, almost within sight of the entrance to the cave. Stephen is buried in the "Old Guide's Cemetery", on the hill south of the cave.

Thank you Stephen!

Sources

Derouchie, Mayo Hanley; Webb, Donna R. Stephen Bishop: Guide Explorer, Slave

Meloy, Harold, The Stephen Bishop Story, A Man and the Legend. 1974 Harold Maloy

IN REMEMBRANCE

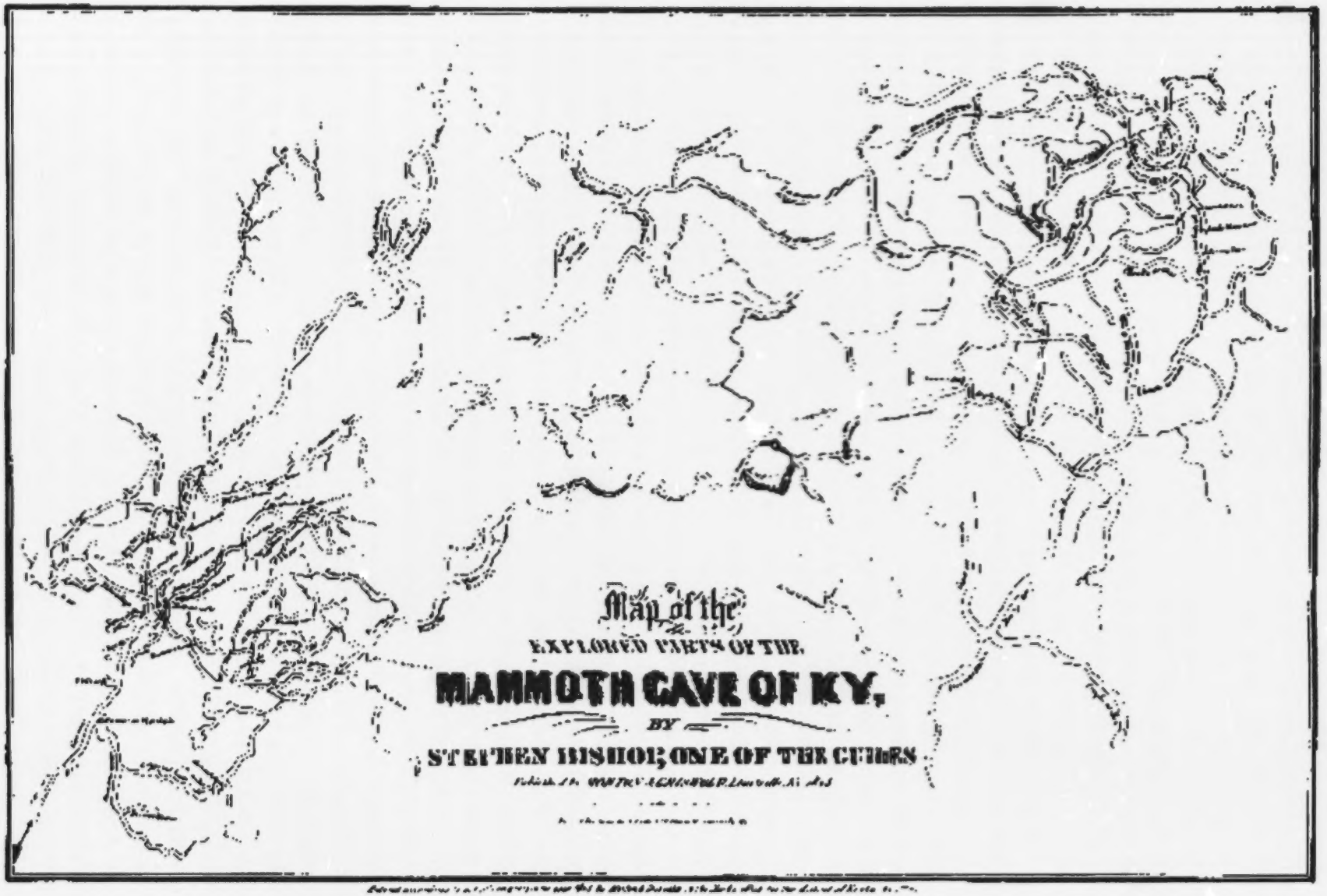
IN REMEMBRANCE ACTIVITY SHEET

NAME:_____ DATE:_____

ANSWER THE FOLLOWING QUESTIONS ON YOUR OWN.

1. Now that you have read about Stephen Bishop and seen a picture of his tombstone, what symbol or drawing would you pick to have at the top of his tombstone? Draw that symbol below.

2. Pretend that you are an early visitor who just came out of the cave. Stephen Bishop was your cave guide. As you rest at the hotel after your long day in the cave, you begin to write a letter to your family or a friend. You may want to tell them about what you saw and what you thought of Stephen Bishop. (If you need more room you can continue on the back.)



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FINDINGS FROM THE FIELD

SUBJECTS: Science, Social Studies, Career Education, Government, Language Arts and Art.

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: use reference and research tools; make sense of a variety of materials they read; organize information and use of classification rules and systems; write using appropriate forms for different audiences and purposes; speak using appropriate forms for different audiences and purposes; make sense of and communicate ideas with the visual arts; understand scientific ways of thinking and working; understand conditions of nature; understand the democratic principles; create works of art and make presentations; analyze their own and others' artistic products; show their ability to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; use critical thinking to solve a variety of problems in real-life situations; organize information to develop or change their understanding of a concept; connect knowledge and experiences from different subject areas; and use what they already know to acquire new knowledge, skills, or interpret experiences.

DURATION: One class period of 35-50 minutes

GROUP SIZE: One or two classes fo 10-60 students

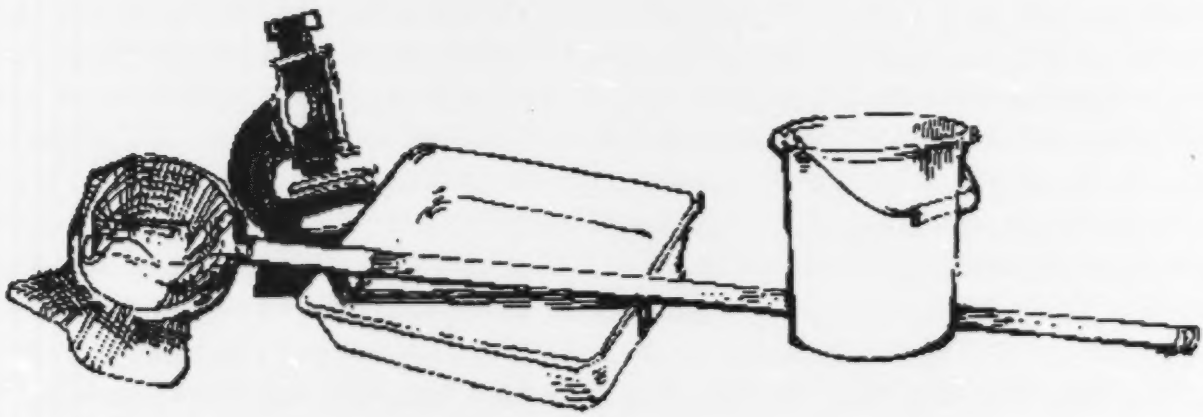
SETTING: Indoors or outside

KEY VOCABULARY: Naturalist, journal, evaluate, regions, habitats, boundary and observation

ANTICIPATORY SET: Has anyone ever kept a diary or journal? What types of things do we write about? Scientists often keep a daily record of what they observe when they work on an experiment or "in the field."

OBJECTIVES: The students will be able to: 1) evaluate journal entries and retrieve important information of a field study; 2) identify at least two animals and their habitats

MATERIALS:
- colored pencils
- crayons or markers
- seven journal entries
- large sheets of paper or poster board



FINDINGS FROM THE FIELD

BACKGROUND: For years scientists have developed various ways to keep and record information. Scientists who spend a large portion of their time outdoors or "in the field" making observations usually record their findings in a field notebook or journal. They record items such as their location, number of animals seen, weather or anything specific to that day.

Scientists in a laboratory are in a more controlled environment. Their research is more methodical. They follow specific steps of acquiring information. These steps include **hypothesis, questioning, experimentation, observation** and **conclusion.**

Claude W. Hibbard was the first naturalist at Mammoth Cave National Park (June 1, 1934 to August 22, 1935). His job was to evaluate the area and record the types of wildlife he found in this region. Hibbard was to look at various habitats in this region and evaluate them to help determine what should be included in the "new" national park. Before this area became a national park there were many farms and several small communities that were well established. Animals were very scarce and some species were rarely seen. Squirrels were an animal Hibbard had difficulty finding and much of their habitat was destroyed in the spring just as the babies were being born. We might find it hard to believe that squirrels were not as common then as they are today. Part of his job was to review his notes on various animal species that where found and to help develop boundaries for what was to become Mammoth Cave National Park.

In the journal entries, information has been added in [brackets] to help name the animal Hibbard is writing about. If you read [sic] that means that is the way it was written in the journal – so the word may be spelled wrong or have incorrect punctuation.

PROCEDURE:

1. After discussing the uses of a journal, the teacher tells the students that they are going to look at a few journal entries from the first naturalist at Mammoth Cave National Park. His name was Claude W. Hibbard and he spent over a year recording various animals and where they were found. He was here to evaluate the various regions surrounding the cave to determine what areas should be included in the national park boundary.

2. The teacher places the students into groups of four to six students and hands each group a different journal entry. The groups read their entries.

3. Then each group receives a large piece of paper to draw the habitat described in their entry and to prepare a list of reasons why it is important that their area be protected in the new park.

4. Once the groups have completed their poster and list, the teacher asks for the first group to present why their area is important and needs to be included.

5. The class discusses the importance of protecting various habitats to maintain a diversity of plant and animal life in our world. Each area has special qualities that are worth protecting. If Hibbard had not taken such complete notes would we have been able to work on this project? Because of his notes we are able to look back over many years to get an idea of what this area looked like as the park was being formed.

CLOSURE: Observation is the most important skill of a scientist. They need to take time to notice and record the data or objects for a given area to be able to refer to it at a later time and to appreciate its differences.

EVALUATION: The teacher is able to evaluate the students through class discussion, group interaction and the completed drawings and lists.

EXTENSIONS:

1. Look at writings from other famous naturalists like John Muir and report on a place that was special to Muir.

2. The class could take a trip outdoors, on the school grounds or another location, to record what wildlife they find. Put these observations together in a field notebook.

3. Obtain a copy of the old homestead map and try to locate the areas discussed in the journal entries on the map and then compare that to a current map of the same area.

Journal Entry- Area 1

July 24, 1934

Dixon Cave was visited for the first time which is a sort [sic- short] distance north of the entrance of old Mammoth Cave. The cave is large, having a high ceiling ranging from 40 to 60 ft. It is about 1/4 mile long. In the back of the cave were found two groups of Bats (Myotis sodalis) and a few scattered ones, about 350 in number, a few flew at our approach, two specimens were collected. Eight *Pipistrellus subflavus subflavus* [bat– Eastern Pipistrelle] were found hanging singly from the ceiling. The bats hanging singly were covered with small drops of moisture clinging to the fur. The temperatures, at the ceiling 46° F., and at the floor 56° F. Pack rats [sic] signs were observed well back in the cave where there is total darkness. At the entrance were found: one *Terrapene canolina canolina* [box turtle], 3 *Rana palustris* [pickerel frog, spring frog], 2 *plethodon glutinosus* [slimy salamander], and 1 *Eurycea longicauda* [long-tailed salamander]. The salamanders were under old rotten lumber at entrance where the ground was kept moist by the slow dripping of water from the walls of the cave at the entrance.

Journal Entry- Area 2

July 25, 1934

The first day that I arrived at the park, May 31, I heard rumors about the blind fish, especially that no authentic record was known of blind fish from Mammoth Cave and the Park area; though all roadside stands have blind fish to sell. At present the owners of the stands are paying local men and boys $1. per inch for blind fish and selling them for $2.50 to $5.00 apiece. While working at Stockholm I came in contact with Mr. W. E. Constant who had always lived in this region and had collected arrowheads, other Indian material, and digging up graves for Indian bones, and collecting blind fish to sell to tourists visiting this region. He told me of two places that blind fish occured [sic] in the Park area where they were collected and sold as coming from Old Mammoth Cave in Echo River; one was Cedar Sink, and the other was Sanders' Spring on the north side of Green River just north of Sander's Ferry crossing. Sanders [sic] Spring was visited the forenoon of July 25, by Clumbo Hyde an assistant C.C.C. enrollee, Mr. Constant and myself. Here a permanent spring runs through a small cave at the entrance one may stand erect, but following the stream one must soon crawl. Blind crayfish are common throughout the stream. Blind fish were observed the 3/4 of a mile traveled after we were in the cave, beyond the influence of light. They were hard to observe. If one wades in the stream they will take refuge under rocks when vibration is set up in the water. When a pool could be approached freely about. Only *Typhlechthys subterraneus* (Girard) [blind cave fish] were found and collected. They are white in color with the blood of the gills and heart showing through, giving it the effect of a pink color. They are both beautiful and graceful in their movements in clear streams. The temperature of the water was 56° F. Along the entire stream bed were tracks of coon and evidence of their feeding upon the crayfish in the stream. In the entrance of the cave. *Rana patustris* [pickerel frog, spring frog] was common and adult *Plethodon glutinosus* [slimy salamander] and *Eurycea longicauda* [long-tailed salamander] were taken. *Pipistrellas subflavus subflavus* [bat– Eastern Pipistrelle] were observed in the opening leading to the left upon entering the cave. They were hanging singly from the low ceiling. Over three hours were spent in the cave.

Journal Entry- Area 3

October 3, 1934

A number of deer tracks had been reported by our erosion crew working in Woolsey Valley. The area was carefully covered and a number or tracks were found, ranging from those of large bucks to those of fawns. The tracks of a yearling were observed for over a 1/4 of a mile where it had been chased by a dog. In the small gullies where the tracks were common, cedars were found along the edges and on the slopes. A short distance up the valley is a small pond with clear fresh water fed by a spring and the overflow disappearing in a sink. Around the marshy border is a large bed of cat tail in which were observed rusty black birds. A Kingfisher was seen feeding upon a small fish using the limbs of Hickories along the banks as perches, from which he could overlook the water. Coon tracks were common around the edge of the pond and a few opossum tracks were observed. Signs of deer using it as a watering place were present but not enough to be frequent. On the east side of [the] valley by a small sink which had grown up to vegetation and is shaded by oaks, was found a spot grown up to a tender weed (kind unknown) which had been browsed close to the ground by the deer.

Journal Entry- Area 4

October 24, 1934

The day was spent in Strawberry Valley, which is a small valley along the Edmonson, Hart, and Barren County lines. This is a region in which intensive farming has been practiced, in that field after field has been turned into pasture. Due to farming and pasturing, much erosion has resulted. The day that I was in this valley, Camp #2 started their erosion work for planting. The valley is made up of a series of sinks which is typical of all Hollows and Valleys south of Green River. In the Valley is a large natural pond which affords a permanent water supply for wildlife. A large blue heron was at the pond, and from the tracks, it had been a regular visitor. Many killdeer were also around the pond. This is the ideal place for the study of shore birds during migration. Mammals were scarce only cotton-tail rabbits were observed (3). A few grey fox tracks, one opossum was observed and one skunk. Song birds were numerous in old fields and along the wooded slopes and ridges.

Journal Entry- Area 5

November 7, 1934

The afternoon was spent with Mr. Holland on Green River. Many gray squirrels were seen along the banks both gathering nuts and in the trees. A number of chipmunks were heard calling. A large number of turtles were present on logs and the bank taking advantage of the small amount of warm sunlight. No shore or water birds were seen. Though the River presents an abundant supply of water, it is not suitable for the above due to the great depth of the water and the lack of mud flats and sandbars. Also very seldom is the bank exposed as it is over grown with Willows on other bank. A number of birds were present along the bank - a redtailed hawk, Broad winged and Marsh Hawk was observed along the tops of the ridges bordering the river. It was a good day to view tracks as the river had just gone down and the banks were covered with soft mud. Only tracks of turtles were observed.

Journal Entry- Area 6

January 8, 1935

A continuous rain fell during the day. The country was worked from Mammoth Cave to Buffalo Ferry. On the ridge between turnhole and Silent Grove schoolhouse a flock of starlings consisting of hundreds were observed. They were very shy and could not be approached very close on in a running car and would fly as soon as the car was stopped near them. Black vultures roost along the river just below and above turn hole. They were just starting on their morning search for food and many came flying low over the ridge going toward the southwest. It presented quite a sight as twelve came into view at once. After coming over the ridge they began to take on altitude much different from the turkey vulture as they flew in a small circle laboriously flapping their wings slowly getting higher and moving on out of sight. The country was then covered between camp #3 by Salons [sic] Crossing and Union City. A sawmill had been moved in on tract and was in full operation regardless of the weather. At that time they were concentrating on yellow poplar, *Liriodendron Tulipifera*. The Brownsville lumber company was hauling away the lumber which was hauled to the road on sleds. Another instance where they have been able to take advantage of the roads built in the park. If the road had not been improved it would have been impossible to haul by truck and would not have paid if they had to take it out that distance by team. They intend to remove everything possible that will make a board.

Journal Entry- Area 7

July 10, 1935

A survey was made of First Creek from head to Nolin River. Starting at the head one finds sandstone formation which soon narrows to a small stream course, rather deep with numerous falls from 1 to 15 feet in height. Along this region are hemlock, holly, magnolia, mountain laurel and yellow birch. Minnows are not found in this area since they are unable to get over the falls. At the last fall there was observed [sic] a number of minnows in a small pool. Here the stream has cut through the sandstone and sinks into the underlying limestone. Just before it sinks there may be observed close to the channel a small sink with a rushing current at a lower level. The stream reappears again in a short distance as a spring in the rise of the channel from under a layer of limestone. The stream continues now for over 2 1/2 miles with small pools, some 4 feet deep. Only large minnows and many smaller ones appear in it. As it nears the river and a broad valley floor, it disappears about 1/2 mile above First Creek lakes, to reappear again a short distance above the lake. The lake covers at least three acres and is about 10 feet deep in places. Turtles are abundant and many fish - some are large. This area is flooded by back water from Nolin River during high stages. A nice stream leads from the lake into Nolin River.

COVER ALL!

SUBJECTS: Science, Social Studies, Language Arts, and Mathematics

GRADES: 4-5

KERA GOALS: Meets KERA goals 1, 2, 3, 4, 5, and 6

ACADEMIC EXPECTATIONS: make sense of various messages to which they listen; organize information and the use of classification rules and systems; understand scientific ways of thinking and working; identify, analyze, and use patterns; understand the democratic principles; show their ability to become self-sufficient individuals; show their abilities to become responsible members of a family, work group, or community; organize information to develop or change their understanding of a concept; use a decision-making process to make informed decisions; connect knowledge and experiences from different subject areas; and use what they already know to acquire new knowledge, skills, or interpret experiences.

DURATION: One class period of 25-30 minutes

GROUP SIZE: One or two classes of 10-60 students

SETTING: Indoors or outside at tables

KEY VOCABULARY: PARKO, classify, and the included word list

ANTICIPATORY SET: Has any one heard the term "cover all" before? It comes from a game we know as BINGO. Today we are going to play "PARKO" and it is going to cover all the areas we know about Mammoth Cave National Park.

OBJECTIVES: The students will be able to: 1) recognize various words and their relationship to Mammoth Cave National Park; 2) classify various words into their correct category.

MATERIALS:
- Pencils,
- PARKO cards
- word list
- chips or beans
- word list words on cards
- bowl

BACKGROUND: As a culminating lesson to the fourth and fifth grade curriculum, we have pulled various words from earlier lessons that address the following areas:

P- PLANTS
A- ANIMALS
R- ROCKS
K- human**KIND**
O- H_2O

This gives the students a chance to review and reinforce various topics from earlier lessons.

COVER ALL!

PROCEDURE:

1. The teacher asks if the students have played BINGO before. The teacher tells the students that today we are going to play a new form of that game. We are going to play PARKO. The teacher writes the letters P A R K O on the blackboard. Then they ask the students, "What big topic might each letter stand for? What things do we think of when we think of a National Park or of Mammoth Cave National Park?"

2. The students try to identify the topics. The teacher may want to remind the students to think of the patch that the rangers wear on their sleeves. The teacher offers clues or help as needed.

3. Each student is given a card and a word list. The students are to take the word list and fill in words in the appropriate columns. The teacher may give an example like limestone is a .... rock, so it goes in the **R** column for **R**ocks.

4. After the student's cards are created the teacher pulls the various words from a bowl. As the students find the words on their card, they cover them. Once a student gets five in a row, four corners, or covers all depending on the rules for that game they yell "PARKO".

5. When a student yells, "PARKO" they must then read the column title and the word (example **K**- Stephen Bishop). The word must be appropriate to the column's title to count. To win, the student has to share one thing they have learned about Mammoth Cave. For example– Limestone would need to be in the **R**- **R**ock column, if it was under **K**- human**K**ind it would not count.

6. The class can play several rounds. As a "prize" for getting "PARKO" the teacher can allow that student to pick the cards for the next round.

7. The teacher collects the cards to evaluate the students' skills in classifying their words.

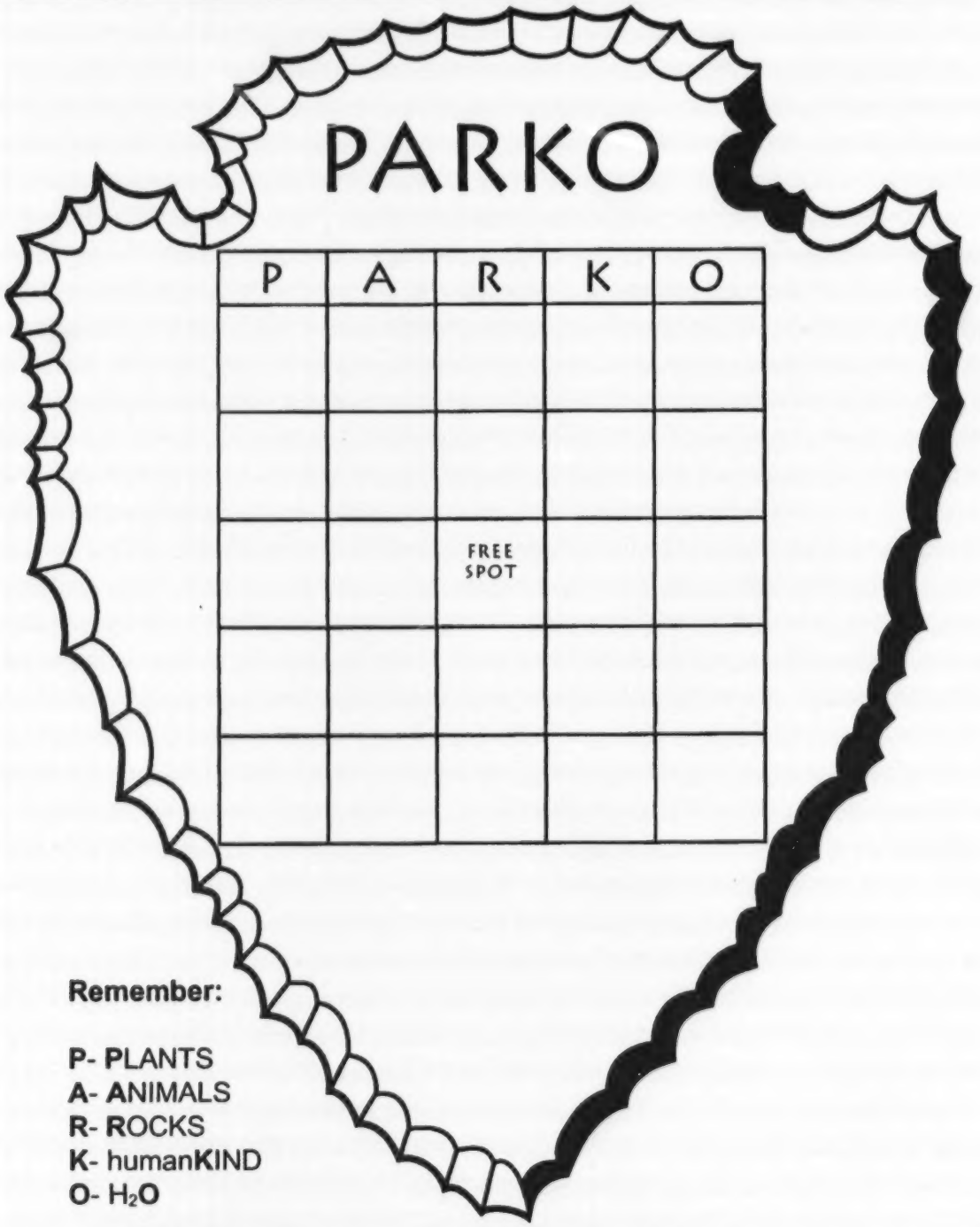
CLOSURE: This activity helped us to review many of the words we have talked about while studying about Mammoth Cave National Park. It also helped us to classify words in various categories.

EVALUATION: The teacher is able to evaluate the students by how well they create their cards and classified their words.

EXTENSIONS:

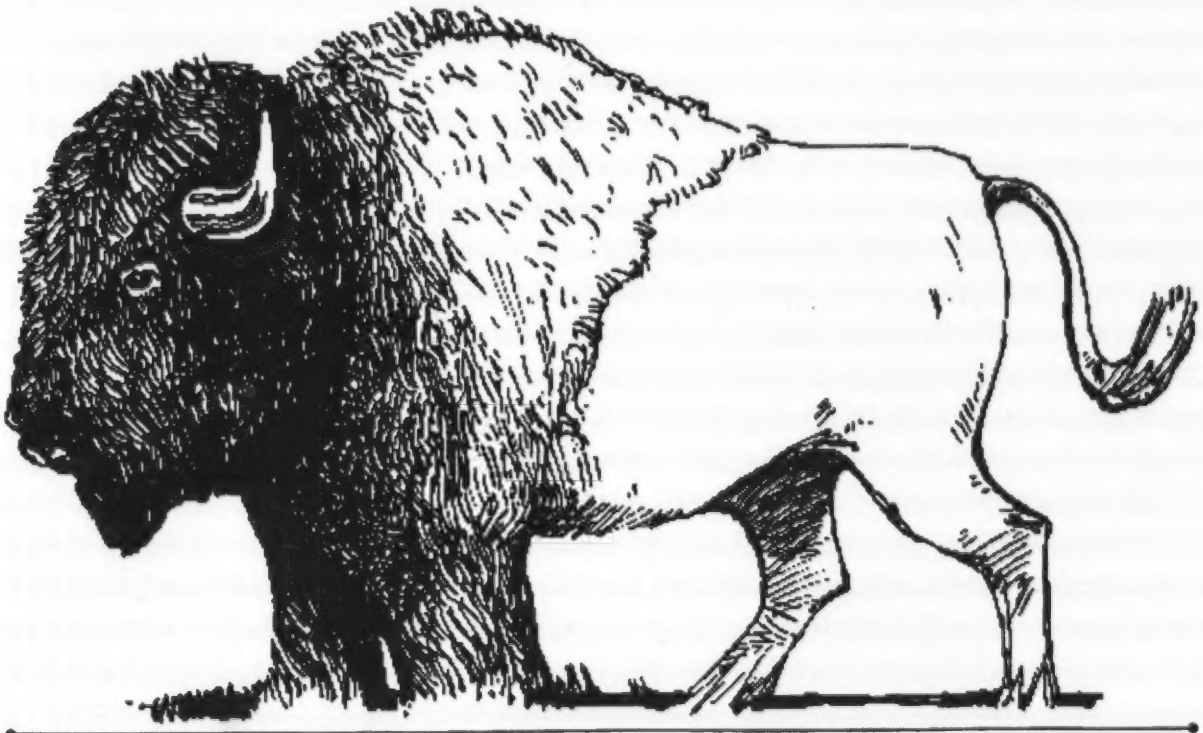
1. Play the game again, but this time they must tell why each word that they had covered to win is important to Mammoth Cave.

2. The class plays PARKO. At the end of the last round the students have to take each one of their covered words and write a story including those words.


PARKO
P A R K O
FREE SPOT
Remember:
P- PLANTS
A- ANIMALS
R- ROCKS
K- humanKIND
O- H_2O

COVER ALL! · WORD LIST

Tulip Poplar	Stephen Bishop	Oak	Limestone	Non-Point Pollution
Christmas Fern	White-Tailed Deer	Prehistoric People	Claude W. Hubbard	Cave Owners
Sandstone	Beaver	Groundwater	Springs	Wood Violet
Raccoon	Dogwood	Cave Fish	Longhunters	Caprock
Red-Tailed Hawk	Floyd Collins	Floods	Dye Tracing	Watershed
Matt Bransford	Green River	Cedar	Black Bear	Sinkhole
Calcite	Stalactite	Box Turtle	Redbud	Acorn
Wild Turkey	Fossils	Visitors	Turbidity	Dr. John Croghan
Great Horned Owl	Echo River System	Little Brown Bat	Disappearing Streams	Gypsum
Park Ranger	Cave Cricket	Sycamore	Column	Daffodil
Flowstone	Scientist	Hickory	Pioneers	Crayfish
Cane Reed	Hydrology	Stalagmites	Point Pollution	Buffalo



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